SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class matter. Copyrighted, 1894, by Munn & Co.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LXX.—No. 17.
ESTABLISHED 1845

NEW YORK, APRIL 28, 1894.

$3.00 A YEAR.
WEEKLY.

1. Mott Haven station. 2. Work in progress near Harlem bridge. 3. Completed structure. 4. Harlem bridge. 5. False work near 110th St. 6 and 7. Work of erection by means of wooden trusses. 8. The old and the new.

THE PARK AVENUE IMPROVEMENT IN NEW YORK CITY.—[See page 263.]

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year, for the U. S., Canada or Mexico.....$3 00
One copy, six months, for the U. S., Canada or Mexico..... 1 50
One copy, one year, to any foreign country belonging to Postal Union. 4 00
Remit by postal or express money order, or by bank draft or check.
MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

The Scientific American Supplement

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5.00 a year, for the U. S., Canada or Mexico. $6.00 a year to foreign countries belonging to the Postal Union. Single copies, 10 cents. Sold by all newsdealers throughout the country. See prospectus, last page.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, to one address in U. S., Canada or Mexico, on receipt of *seven dollars*. To foreign countries within Postal Union, *eight dollars and fifty cents* a year.

Building Edition.

THE ARCHITECTS AND BUILDERS EDITION OF THE SCIENTIFIC AMERICAN is a large and splendid illustrated periodical, issued monthly, containing floor plans, perspective views, and sheets of constructive details, pertaining to modern architecture. Each number is illustrated with beautiful plates, showing desirable dwellings, public buildings and architectural work in great variety. To builders and all who contemplate building this work is invaluable. Has the largest circulation of any architectural publication in the world.

Single copies 25 cents. By mail, to any part of the United States, Canada or Mexico, $2.50 a year. To Foreign Postal Union countries, $3.00 a year. Combined rate for BUILDING EDITION with SCIENTIFIC AMERICAN, to one address, $5.00 a year. To foreign Postal Union countries, $5.50 a year. Combined rate for BUILDING EDITION, SCIENTIFIC AMERICAN and SUPPLEMENT, $9.00 a year. To foreign Postal Union countries, $11.00 a year.

Spanish Edition of the Scientific American.

LA AMERICA CIENTIFICA E INDUSTRIAL (Spanish trade edition of the SCIENTIFIC AMERICAN) is published monthly, uniform in size and typography with the SCIENTIFIC AMERICAN. Every number of *La America* is profusely illustrated. It is the finest scientific, industrial trade paper printed in the Spanish language. It circulates throughout Cuba, the West Indies, Mexico, Central and South America, Spain and Spanish possessions—wherever the Spanish language is spoken. $3.00 a year, post paid to any part of the world. Single copies 25 cents. See prospectus.

MUNN & CO., Publishers,
361 Broadway, New York.

☞ The safest way to remit is by postal order, express money order, draft or bank check. Make all remittances payable to order of MUNN & CO.

☞ Readers are *specially requested* to notify the publishers in case of any failure, delay, or irregularity in receipt of papers.

NEW YORK, SATURDAY, APRIL 28, 1894.

Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF

SCIENTIFIC AMERICAN SUPPLEMENT

No. 956.

For the Week Ending April 28, 1894.

Price 10 cents. For sale by all newsdealers.

CONTAGION IN MILK.

There is a strong tendency on the part of humanity to make facts fit a theory. When a theory has been evolved which seems ingenious and which exemplifies what may be termed the natural unities, even the best trained scientific minds are reluctant to acknowledge its defects. This has gone so far that the highest advance in scientific training has for its result the inculcation of a willingness to abandon theories and of a readiness to yield up preconceived ideas to facts. The germ theory of disease was accepted as a very beautiful one. Soon after its general acceptance what may be termed bacterial analysis was worked up, and the investigator had put within his power the determination of the number of germs in a substance. To analyze a sparkling sample of water or clear piece of ice, and to determine with accuracy the number of germs per cubic centimeter in the apparently pure material, is certainly one of the triumphs of the laboratory. But when to this is added the microscopic examination of individual organisms and their identification as the causes of specific diseases, the way seems open for the perfect prophylaxis of disease, or for its extermination in the discovery of a substance which is poisonous to the disease organism and harmless to the human system.

Many mistakes and wrong assumptions have marked the progress of bacterial investigations. Attempts have been made to determine or rather to specify how many germ centers per cubic centimeter are admissible in drinking water. Investigations on the germs in ice have shown that it often contains large quantities. But the sum of all the work leads to the conclusion that if we are on the threshold of a revolution in sanitary practice, we certainly have not crossed it.

One curious fact has thrown some confusion on the matter. If a large number of bacteria are present in water, *a priori* considerations would pronounce it unhealthy. But it may happen that these bacteria are of a type that cannot exist in contaminated water, and they may be the best possible pledge for its healthfulness.

The bacteriologist works on the system of cultivating the organisms he works on, and as culture medium employs various gelatine solutions. These are found favorable for the growths in question. In our articles of everyday consumption we find in milk what, to a considerable extent, is an ideal culture medium for bacteria. If organisms dangerous or fatal to the human system get into milk, what, in the present aspect of our knowledge, seems a most favorable condition for the propagation of disease is brought about. In milk the dangerous organisms can live and thrive, and the extended use of milk makes it an effective agent of contagion.

In the town of Montclair, N. J., a number of cases of typhoid fever have occurred recently, which appear to be due to contaminated milk. The milkman who supplied the milk lived in a village about three miles distant, and lying on the other side of what is termed the Orange Mountain. This is a hill of trap rock interposing a barrier between the two localities. The drainage of one place is effectively shut off from the other.

A number of weeks before the disease appeared in Montclair there were two cases of typhoid fever in the milkman's family. The milk meanwhile was taken daily to Montclair and sold to the dealer's customers. Recently typhoid fever made its appearance in Montclair, and a number of deaths from this and similar complaints were recorded, most of which were apparently traceable to this milk—at least those affected with typhoid fever were consumers of the milk in question. Besides the deaths there have been a large number of fever cases, and of these very many occurred in families using the milk. One theory holds that the well on the milkman's place had become infected. The bottles in which the milk was delivered were washed with water from this well, and the germs of contagion it is supposed were thus introduced.

Nothing is more difficult than to accurately trace the source of such epidemics as this. If no one was affected except those using the suspected article, the case would appear a conclusive one. But it always or nearly always appears that there are cases which cannot be traced to the suspected source, and these occasion at least some doubt in the matter. A large and prosperous settlement suffers in reputation from such occurrences, often, perhaps generally, quite unjustly. If the trouble can be located, as it is in this case, there is service done to the community, and the physician and sanitarian both can feel that their profession has in a sense achieved a triumph. The location of a trouble is more than half the cure.

In the fever cases at Montclair a high measure of certainty is attainable. In brief, the known typhoid cases all occurred in individuals who had partaken of the milk. The origin of the disease is thus fixed about as certainly as is possible in such cases, and the outbreak so definitely limited may be taken as a tribute to the healthfulness of general local conditions.

At the present day, with modern house sanitation and with good water supply, the community seems safe against the dreadful plagues such as described by Boccaccio and Defoe. The fact that an outbreak such as that at Montclair attracts so much attention is really the best proof of the good hygiene of modern conditions. A little care would seem to almost insure humanity from these dangers. Sterilization of milk is now very extensively practiced, and is carried out in many families.

We have in the SUPPLEMENT published several articles on the subject of sterilization of milk, an operation of the simplest description. It consists of exposing the milk for forty-five minutes to the temperature of live steam at atmospheric pressure. Bottles are conveniently used to contain the fluid. They should be filled with a funnel to keep the necks free from milk, then they should be plugged with cotton, through whose pores it has been found that no germ can penetrate. They are then immersed up to the neck in cold water, which is brought to the boiling point and maintained there for forty-five minutes. They are then removed and set aside to cool. Such milk requires no refrigerator for keeping. Before pouring it out the plug is removed, and it may be well shaken to mix in any cream which has risen. Steam sterilizers are often used, but by the method described any deep cooking utensil will answer the purpose.

It certainly seems that there is no room for alarmists, and that the occurrences, while sad in their effects, are rather tributes to the healthfulness of modern conditions of life, which enable the community to resist the visitations instead of succumbing to them at once in larger numbers.

Sweeping with Compressed Air.

One of the most notable of the present century's small inventions is an air pump for cleaning purposes. A hose pipe charged with air under fifty pounds pressure to the square inch is turned upon the article or room to be cleaned. It is used in precisely the same way as the water and hose for washing purposes. It is far more effective in its result than brooms, beaters or brushes, as it searches out and penetrates every crevice and cleft in woodwork.

This device is at present applied to cleaning cars, but so perfect is its work that it is only a question of time when it will come into use for other purposes. Hotels and large buildings might be swept out and dusted in an incredibly short space of time. Carefully managed, this air pressure would rid the room of every particle of dust, clean furniture, carpets and the heavier articles of bric-a-brac and ornaments. It would do the work of a dozen people.

It is now in order for some home missionary to invent some simple device that will work an air pump and current for household use. Its introduction would revolutionize housekeeping and solve the heretofore hopeless problem of clean rooms, and will keep furniture covers and carpets. It would be economical, as it would render less service necessary and would save a large portion of the wear and tear of furnishing textiles. In houses where there is hydrant water it would not be at all difficult to attach an air pumping apparatus to the kitchen or bathroom faucet and thus furnish power for every floor.

Some years ago it was said that there would never be an invention that could sweep and dust, but at the present rate of things the problem is practically solved by this simple and easily used device.—*Chicago Dispatch.*

International Exhibitions of 1894.

The year 1894 will be signalized by a remarkable series of international exhibitions. On May 5 the Antwerp Exposition will be opened by the King of the Belgians, and will probably prove to be the largest and most attractive exhibition held in 1894. The World's Exposition at Lyons, held by the authority of the French government, will be opened on April 28. Great preparations have been made to render it a magnificent affair. On May 1 a "Grand International Exposition" will be opened at Madrid. The exposition will be held in a stately building, and most of the European nations will participate. There will also be an international exposition at Vienna, the preparations for which are well under way. The San Francisco Midwinter Fair can certainly take rank as an international exhibition on account of the large number of countries represented—thirty-eight in all. It is a curious fact that after each of the great international expositions a series of international and semi-international fairs are held within a year or two.

Hydrocarbon Fats.

B. Haack has recently demonstrated that by heating the naphthalene hydrocarbons with sulphuric acid and manganese peroxide—whereby ozone is generated—an oxidized product is obtained which, after being purified by distillation in vacuo, yields a refined oil containing 60·8 per cent of matter directly saponifiable by alkalies. Exposed to the air, the product loses this power, and is also decomposed by changes of temperature.

Planet Notes for May.

H. C. WILSON.

Mercury will be at superior conjunction, *i. e.*, behind the sun, May 20, at 9 h. 44 m., central time. During May this planet will be wholly hidden to the eye by the glare of the sun, although it is calculated to reach its greatest brilliancy on the 23d.

Venus will be in good position for observation about 4 o'clock in the morning during May. Her phase will increase from about half to two-thirds during the month, while her brilliancy will diminish in the ratio of 137 to 97 in the same time, because of her recession from the earth. Venus and the waning moon will be in conjunction May 1 at 5 h. 7 m. P. M., central time, and again May 31, at 3 h. P. M.

Mars is also to be observed in the morning. He is about 30° west and 14° south from Venus, in the constellation Capricorn, and will move northeast into Aquarius during May. At the end of the month he will be found about half way between the first magnitude stars Fomalhaut (*α Piscis Austrini*) and Markab (*α Pegasi*). Mars will be in conjunction with the moon March 28, at 2 h 18 m., central time. Observers in Central and South America may see the planet occulted at this time.

Jupiter and *Neptune* will be too low in the west during the early evening hours for any satisfactory observations during this month. The tables of the satellites are therefore omitted. On Poole Bros.' map for this month, however, the courses of Jupiter and Neptune among the stars are indicated for the six months from April 1 to September 1.

Saturn will be in best position for observation during May, crossing the meridian about 10 o'clock in the first half and 9 o'clock P. M. in the latter half of the month. The rings of Saturn are now pretty well widened out, so that the three parts can be distinguished readily and the Cassini division can be followed all the way around. The elevation of the earth above the plane of the rings is about 12°. Saturn is in the constellation Virgo, about 5° north of the first magnitude star Spica, with which he is almost equal in brightness. A conjunction of the moon and Saturn occurs May 16, at 10 h. 55 m. A. M.

Uranus is also in good position for observation, being at opposition May 3.

The four oldest of the minor planets, Ceres, Pallas, Juno and Vesta, all happen to be in the region of sky covered this month by Poole Bros.' map, and their apparent courses for the next six months are shown in red upon the map. Ceres, Pallas and Vesta have passed the best time for their observation, but will be bright enough to be found without much difficulty during the next three months. Ceres was at opposition March 13. Its brightness will be equal to that of a star of the 7·2 magnitude April 1, 7·5 m. May 1, 7·9 m. June 1, 8·2 m. July 1, 8·5 m. August 1, and 8·8 m. September 1. Pallas was at opposition February 7. Its brightness will be 7·0 m. April 1, 7·6 m. May 1, 8·1 m. June 1, 8·5 m. July 1, 8·8 m. August 1, and 9·1 m. September 1. Vesta was at opposition March 10. Its brightness will be 6·5 m. April 1, 6·8 m. May 1, 7·2 m. June 1, 7·5 m. July 1, 7·8 m. August 1 and 7·9 m. September 1. Juno is not so favorably situated. Although she comes to opposition May 7, she is so far from her perihelion, or point of nearest approach to the sun, that she will at brightest be only of the tenth magnitude, and will, therefore, probably not be seen by the amateur.—*Popular Astronomy.*

[FROM THE BRITISH JOURNAL.]

Photographic Notes.

How Long should Prints be Washed?—This, says Herr Liesegang, in the *Archiv*, depends on the manner of washing. He recommends the addition of a substance to the toning and fixing baths, which shall act as an indicator. As such, eosine, in the proportion of 0·02 per cent, has given him the best results. He washes until the red coloration has disappeared from the backs of the prints.

Increasing the Sensitiveness of a Plate.—Mr. P. B. de Laborre says that, to impart a high degree of sensitiveness to a plate, in order, say, to take an instantaneous portrait in the studio, it should be immersed for a minute or two in the following solution:

Bichromate of potassium	2 parts.
Distilled water	100 "

This is said to make the plate more sensitive, and it should then be exposed, without washing, and while still wet.

Blood-Red Tones on Bromide Prints.—According to the Paris *Photographe*, such tones are obtained in the following way: The print, after being fixed and washed, is immersed in a fifteen per cent solution of bichloride of copper. The elimination of the excess of copper salt having then been removed by careful washing, the print is placed for several seconds in a solution of ferrocyanide of potassium (strength not stated), is again thoroughly washed, and then once more passed through a solution of cupric chloride, when the red image is immediately seen to appear.

Washing Albumen Prints. In the first number of *Das Atelier des Photographen*, which is under the editorship of Dr. Miethe, the latter discusses the experiments of Messrs. Grundy and Haddon on the amounts of silver and sulphur left in albumenized prints at different stages of washing. These he summarizes as follows: 1, ten minutes' washing eliminates all soluble matter; 2, further washing extracts no more sulphur or silver, supposing that all the free silver salt of the print has been converted into the soluble silver hyposulphite. To assure the latter condition, the author recommends fixation in a first hypo bath (forty to fifty grammes of salt in 400 or 500 c. c. of water per sheet), to wash for ten minutes in running water, and then place the prints in a second hypo bath (six to ten grammes of hypo in 150 c. c. of water, per sheet), leave in for at least eight minutes, and finally wash in running water for from ten to fifteen minutes.

Uranium Toning of Platinum Prints.—A writer in the *Photographic Gazette* recommends the prints to be made by the cold-bath process, an addition to the developer being made of ten to twenty per cent of a four per cent solution of bichloride of mercury. This gives a brown image to start with. After fixing with HCl and washing, the following toning bath is applied: Uranium nitrate, 5 parts; potassium ferridcyanide, 1 part; acetic acid, 30 parts; water, 500 parts. The print at first takes a sepia tone, which by prolongation of immersion changes to red. The tone may be arrested at any stage. After toning treat the prints with a solution acidified with acetic acid.

Photo.-Dermatology.—Dr. E. Schiff, of Vienna, has been applying photography to the study of the human skin, and, by the aid of a small incandescent lamp and a metallic reflector, has been able to project on that part of the epidermis undergoing examination a light so strong that by the use of very rapid plates all the details of the texture of the skin, and such small markings as are ordinarily non-apparent and are occasionally present, were obtained. The enlarged positives on matt paper are carefully colored, and the results are said to be of great interest to dermatologists.

The Human Hair Industry in Paris.

From an industrial and artistic point of view, says the *Annales Industrielles*, Paris is the center of the fine manufacture of prepared human hair. Of course the reference here is to woman's hair, for man's hair is worthless for any industrial purpose. Aside from the houses that manufacture exclusively for the export trade, the city numbers about 2,000 hair dressers and 5,000 workmen, about half of whom are engaged in the manufacture properly so called.

The source of supply of the hair may be divided into three categories. The hair of the first category is furnished by foreign countries, India and China being the largest suppliers. This hair is exclusively black and gray, and comes in boxes, carefully packed. In addition to these countries, Italy, Spain, Germany, and Russia supply small quantities. The hair from India and China undergoes quite a lengthy preparation. It is first matched, sorted, and combed and then immersed in a solution of soft soap and carbonate of soda, in order to scour it. Upon coming from this bath, it is united root end to root end and formed into locks that are tied near the roots. It afterward remains to render the hair thin and flexible. To this effect, it is first placed in earthen pans filled with chlorureted water and water mixed with hydrochloric acid, which renders it thin and decolorizes it. Then it is immersed in a solution of soft soap and chlorate of potash, in order to render it less brittle. Finally, a definitive color and shade are given it.

A light or blond shade is obtained with oxygenated water or a saturated solution of carbonate of potash. To dye it black, it is boiled for a few hours in a bath prepared with a decoction of nutgalls or Campeachy wood, in which sulphate of iron is dissolved and into which a little sumac is put, in order to give it a luster and remove the bluish tint peculiar to the hair of the dead. Finally, it is bleached by immersing it several times in baths of oxygenated water to which a few drops of ammonia have been added.

Thus prepared, the Chinese or Hindoo hair is sold to the hair dressers, who work it to their fancy, and afterward sell it at more or less moderate prices.

The finest hair, forming the second category, is that of France, and comprises a variety of shades exceeding a hundred.

The most beautiful is furnished by Limousin, Brittany, Normandy, and Beauce. Some lots are derived from young ladies' boarding schools and from convents. All of this is collected by traveling men called "cutters," who make their circuit along toward spring and visit the villages to gather their crop.

In some localities of Brittany and Auvergne, on certain market days, the damsels who desire to sell their head of hair get up on a cask, undo their hair and allow it to fall over their shoulders. An auction soon begins and every lot, as soon as cut, is delivered to the highest bidder for spot cash.

This product does not pass into the bath, but is simply combed and then scoured with buckwheat flour.

Finally, the third category comprises hair (which, it must be confessed, is classed among the most esteemed) derived from the sorting of combings collected by rag-pickers, who stuff it into bags just as they find it, soiled by dust, felted by water, and adhering to the sweepings of houses, and sell it to small manufacturers, who undertake to utilize it.

Five operations are necessary in order to make a presentable commercial product of this refuse. They are: (1) cleaning by means of sawdust; (2) slow and careful combing upon cards; (3) equalizing, which, starting from the principle that a hair is a conical tube, consists in rolling the hairs between the two hands in order to make start from the mass those that are "head to point" in order to arrange them "head to head;" (4) classification, by which the hair is separated into three lengths, for "switches" and plaits for women and wigs for men; (5) sorting, a manipulation requiring great patience, and consisting in dividing the hair into seven shades and three sizes, that is to say into twenty-one fractions.

If it were not for the rag-picker this industry would not exist. He sells his gatherings to middlemen, who in turn sell them to the small manufacturers at a profit of fifty per cent.

A sensible difference is made in the trade between the hair derived from living persons and that taken from the dead. The latter becomes easier to break, and can be neither curled nor rolled in shape. This is what makes the Chinese and Indian consignments generally considered as greatly inferior, such hair being almost all taken from patients that have died in the hospitals. Moreover, the workmen who scour such hair are very often afflicted with chronic affections, due to the irritation of the nasal mucous membrane through the deposit of hair dust thereon, and have almost always a husky and clouded voice by reason of the deposit of such dust upon the tonsils and larynx. Again, they are exposed to the contagious diseases to which the owners of the hair succumbed. They contract these infallibly, even, if they happen to wound themselves with the combing cards.

Fine California Marble.

Near the base of the Inyo Mountains, in Owens Valley, California, near the lake of the same name, lie what are, perhaps, the largest and most wonderful deposits of marble that have been as yet discovered. It is impossible to describe truthfully these vast deposits of beautifully colored stone.

There is white, black, blue, and yellow in pure colors, purple veined, black and gold, making a grand variety of colored marbles, very beautiful for interior decorations. The white marble is perfectly clear, the grain is fine, very compact, and will stand great pressure; it is a pure dolomite, therefore, and will take on and retain a very fine polish. The first two stories of the Mills building in San Francisco, as well as a greater part of the interior finish of the same, are done in this material. The main entrance to the building shows what may be done in the way of relief with the white marble. The black is almost identical with the Belgium black marble; it is very difficult to distinguish one from the other when polished. The yellow marbles vary from a delicate cream to a dark mottled orange. There are veins of deeper yellow, with fern-like markings similar to moss agate, and it is particularly adapted for furniture and interior decorations.—*Inyo Index.*

An Iron Railway Tunnel.

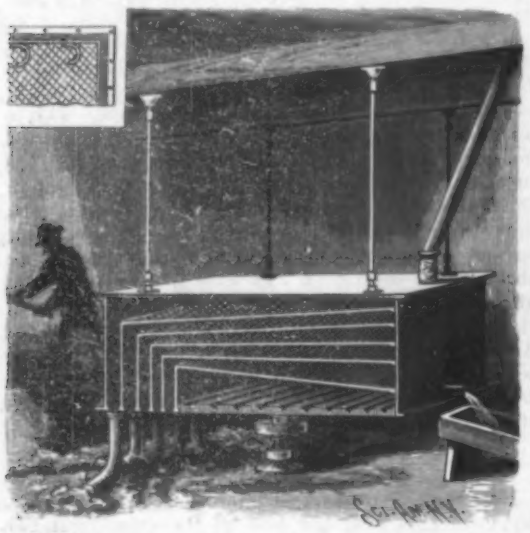
The completion of one of the largest railway iron tunnels in Great Britain at Glasgow—the Mound North tunnel on the North British line—is noted in *Transport.* The mound is a large artificial earthen embankment made across the bed of the old Nor' lock, and carrying the national gallery and one of the main thoroughfares between the old and new towns, and the work has therefore had to be carried out with great care. At the beginning of the tunneling operations a slight "movement" took place at the national gallery, and cracking was observable here and there throughout the building; but nothing very serious occurred. The new tunnel is in effect a huge cast iron tube 17 ft. 6 in. in diameter, composed of segments 4 ft. long by 18 in. in breadth, bolted together through flanges 7 in. deep and 1⅛ in. thick. In cutting the tunnel the shield system was adopted; the average rate of progress per day being one foot nine inches. The appliances used in the construction of this work will now be removed to the south side of the existing tunnel, where a second single-line tunnel in connection with the Waverley Station improvements is also being pierced.

Cost of Food in Different Countries.

According to some recent statistics on the cost of living, an Englishman spends, on an average, $48 a year for food; a Frenchman, $47; a German, $42; a Spaniard, $33; an Italian, $34; and a Russian, $23. Of meat the Englishman eats 109 pounds a year; the Frenchman, 87; the German, 64; the Italian, 26; and the Russian, 51. Of bread the Englishman consumes 380 pounds; the Frenchman, 540; the German 560; the Spaniard, 480; the Italian, 400; and the Russian, 685

A GRADER AND AMALGAMATOR FOR SEPARATING PRECIOUS METALS.

This machine operates mechanically to separate the gold from the tailings. It consists of a gyrating box connected with a stock supply, and containing graduated sieves, the upper sieves inclined downwardly and the lower sieves inclined upwardly to their outlets. The improvement has been patented by Mr. John A. Armbruster, of No. 66 North Canal Street, Chicago, Ill. The top plate of the box is connected by suspending rods having at their upper ends ball and socket joints, with a ceiling or other suitable support, and at the bottom of the box is a suitable mechanism for imparting to it a gyrating motion. On one end of the box is a flexible inlet connected with a shoe leading from the stamp mill, and by means of which the stock, with a considerable quantity of water, is supplied to the box. Arranged in the box are graduated sieves, the larger and coarser of which, at the top, are inclined downwardly, while the lower and finer sieves are inclined upwardly toward individual discharge outlets connected at their lower ends with

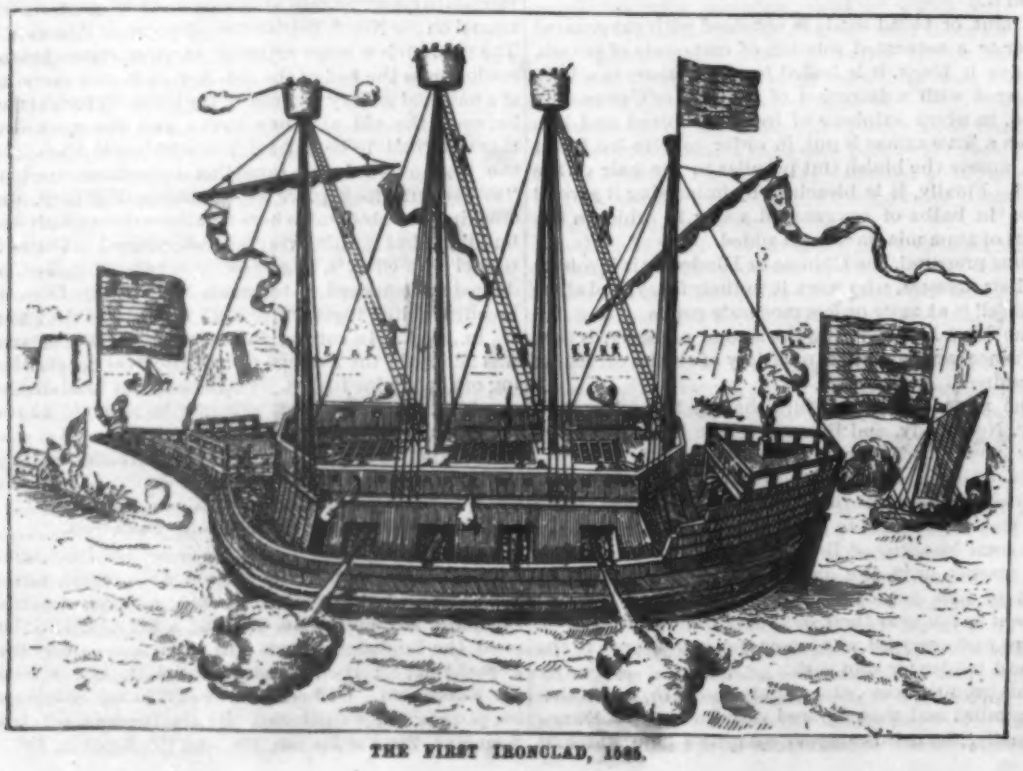


ARMBRUSTER'S GRADER AND AMALGAMATOR.

flexible outlet chutes, discharging tailings on the ground or floor. Below the lowest sieve is a receiving chamber, with an outlet for carrying off surplus water, and in its bottom are recesses, or grooves, containing mercury, to readily take up the gold passing down into this chamber. On the sides of each of the screens are arranged hook-like projections, as shown in the small figure, which serve to throw the material toward the middle of the screen as long as the machine is in motion. The larger tailings, as the stock is discharged into the box with water, have a tendency to roll down the inclined upper sieves toward their respective discharge outlets, the material, as it passes through the successive sieves, remaining longer on the lower and finer sieves, to completely separate the tailings from the valuable stock. The valuable stock which passes through the fine meshes of the lower sieve is readily taken up by the mercury in the pockets, the amalgamated material being from time to time removed for further treatment.

A MEDIÆVAL IRONCLAD.

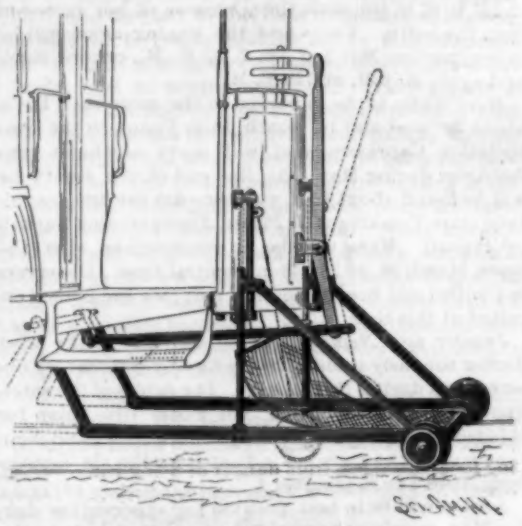
When writing on "A Man of War of 1893," in *The Graphic* of February 10, Commander C. N. Robinson, R. N., mentioned the fact that an armored vessel was constructed in the sixteenth century, thus proving that the idea of protected ships is by no means an absolutely new one. This early ironclad was built in the year 1585 by a shipwright of Antwerp during the wars with the Spaniards. The greater part of the Netherlands had come into the possession of the house of Hapsburg by the marriage of Maximilian of Austria to Mary, daughter of Duke Charles the Bold, in 1477, but under Charles V. the sovereignty was extended until it embraced all the seventeen Belgian and Batavian provinces. When the Lowlands passed to the Spanish crown the principles of the Reformation had spread among the Lowlands, and on the establishment of the Inquisition there in the middle of the sixteenth century disturbances broke out in the provinces, and great cruelties were committed by the Spaniards. Antwerp, which in those days was a margraviate, suffered greatly. It was pillaged by the Spanish soldiery in 1574, and was again besieged in the regency of Alexander of Parma, being taken in 1585. In the summer of that year it was closely invested by land and water, and the people of Antwerp made many gallant efforts to break through the line of the besiegers, especially on the river. For this purpose they built a craft of unusual size, with a flat bottom, and armed its sides with iron plates fastened into great beams of wood. The idea was to make not so much a ship as a floating castle, impregnable to the artillery and missiles of those days, which should crush all opposition. It contained a great number of men, some of whom were placed like sharpshooters in the tops of the masts, and the rest protected by the bulwarks. The men of Antwerp were so confident of the success of their new invention that they called it *Finis Belli*, feeling sure that by its means they would be able to raise the siege and put an end to the war. Unfortunately for the brave burghers of Antwerp, this early ironclad proved a disastrous failure. It was launched upon the Scheldt, and taken across the flooded country by means of a canal cut from the river; but it proved very unhandy, and after a short career got stuck upon a bank. This untimely end of the great vessel from which so much was hoped was a source of much delight and derision to the Spaniards, who nicknamed the monster *Caranjamaula*, which signifies bogey, while the men of Antwerp altered its name from *Finis Belli* to *Perditæ Expensæ*, or "Money thrown away." The crew then deserted the ship, and the Spaniards, after a naval battle, which took place in the flooded country, and resulted in the defeat of the Netherlander, took possession of the naval monster, as they called it, though they feared that, like the Trojan horse, it had been left in their hands from some evil purpose. However, finding that it was really deserted, they seized it, lightened it, and then towed it off and got it back into the river Scheldt. It was then taken in triumph to the camp of Alexander of Parma, where it became one of the sights of the time; and the Spaniards, accepting the omen of its original name, took it as a sign that the war was finished. And, indeed, it proved to be the last effort of the gallant people of Antwerp, for the city was taken on August 17, 1585, and so the first ironclad on record came to an unfortunate end. We are indebted to Mr. J. Coryton for the loan of the volume, "De Leone Belgico, 1588," from which our engraving is taken.—*The Graphic, London.*



THE FIRST IRONCLAD, 1585.

AN IMPROVED CAR FENDER.

This is an efficient and simple safety device to be used at the front ends of electric and cable cars, to prevent persons being run over by the cars. It has been patented by Mr. Benjamin Tranter, of No. 588 Park Avenue, Brooklyn, N. Y. From hangers at the front of the car is suspended a frame designed to be moved in and out at the car end, the front end of the frame resting on small wheels which run on the track, while at the lower ends of the suspension rods are rollers against which the side bars of the frame move without friction. The rear ends of these side bars are pivotally connected to swinging hangers on a trans-

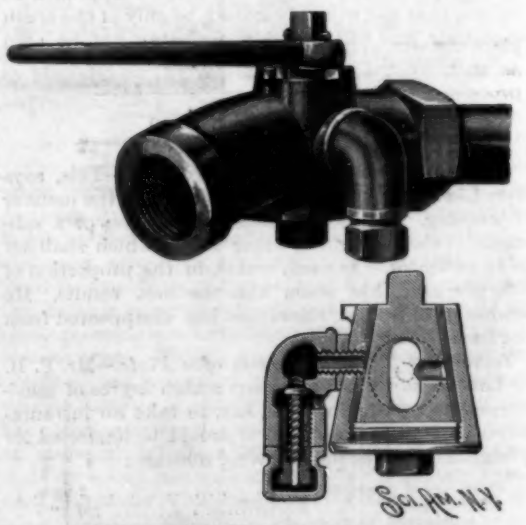


TRANTER'S CAR FENDER.

verse shaft beneath the car floor, and on this shaft is a crank, connected with a forwardly extending pitman pivoted to the lower end of a bent lever whose upper end forms a handle in front of the dashboard. The lever is fulcrumed in lugs on the front of the dashboard, and the front end of the pitman has several holes, so that it may be easily adjusted in relation to the lever. The transverse portion of the fender frame at the front is bent downward toward the track, and may have a rubber or leather covering, and to this portion is secured the front end of the netting, whose rear end is attached to a cross bar of the frame arranged a little below the car floor. The drawing shows in full lines the fender extended as when a person is likely to be run down, but when not in use as a safety fender, the upper end of the lever is thrown forward, as indicated by the dotted lines, swinging back the fender frame beneath the car, and causing its front portion to be drawn up slightly, so that the forward wheels are lifted off the track, in which position the fender is usually carried. The diagonal side braces, extending upward at opposite sides of the fender, may be employed or not as desired, the upper ends of these braces moving upward in slide boxes on vertical rods at the sides of the dashboard as the fender is withdrawn to its rear position.

AN AIR BRAKE STOP COCK.

This is a cock of simple construction, arranged to apply the brakes when the cock is shut off and retain



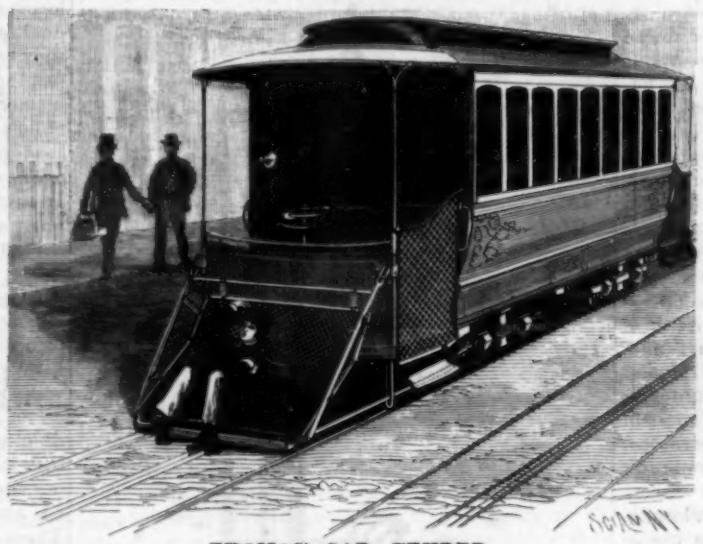
O'LEARY'S TRAIN PIPE STOP COCK.

part of the air pressure in the train pipe, or prevent its reduction to zero, to aid in the release of the brakes when the cock is again opened. The improvement has been patented by Mr. Joseph O'Leary, of No. 238 Iowa Avenue, Memphis, Tenn. The cock has the usual casing, connected at its rear end with the train pipe and at its forward end with the coupling hose leading to the car ahead. Within the casing, as shown in the sectional view, turns the usual plug with a main opening connecting the train pipe with the coupling hose, and into this main opening leads a port adapted to connect the opening with the train pipe at the time the plug is given a quarter turn by means of the handle. When this turn is given to the

plug, the main opening cuts off the train pipe and coupling hose, and at the same time moves the port in register with the coupling hose, the main opening then standing with one end in register with an outlet pipe in one side of the casing. This outlet pipe connects with the interior of an auxiliary valve casing in which is a valve seat adapted to be closed by a valve held to its seat by a spring. The stem of the valve slides in a screw screwing in the casing and supporting its cap, the lower end of the spring also resting on an internal flange of the screw, while the other end of the spring presses against the under side of the valve to hold it normally to its seat. In the auxiliary casing is an outlet leading to the outer air, through which air passes when the auxiliary valve is opened, by which air is released from the train pipe, so that the brakes are applied in the usual manner. When sufficient reduction of air has taken place in the train pipe to equalize the pressure of the spring in the auxiliary valve the latter again closes, retaining a certain amount of air pressure in the train pipe after the brakes have been applied, assisting in the release of the brakes when the stop cock is again opened.

THOMAS' CAR FENDER.

The recent extensive introduction of power-driven street cars in cities has made imperatively necessary some means for protecting foot passengers from danger of being run over. The car fender illustrated constitutes an appliance which provides a catch net with a frame, which bends inward as a heavy body falls into it, forming an effectual receiver. Our cut shows the fender in actual operation. The fender is preferably secured to the grip frame in the case of cable roads or to a supplemental frame carried by the axles on other cars. The striking bar at the front lower edge may be covered by padding. The net, with its flexible frame, is held in position on a diagonal plane by wire helical springs. The thrust of the padded striking bar is received by the fixed frame. Then, as a person is struck, he inevitably falls toward the car and drops upon the net. This at once yields, the side members of the frame bend, the springs stretch, and the net forms a purse or bag, securely holding the person and protecting him from further injury, such as might be incurred by rolling off were the net inflexible.



THOMAS' CAR FENDER.

The inventor, Mr. Charles F. Thomas, Buckeystown, Md., may be addressed for further particulars.

A FUNERAL ON THE RIVER SPREE.

About fifty miles south of Berlin, in the Spreewalde, on the borders of Bohemia, funerals on the ice are of no uncommon occurrence. Here, says the *Graphic*, is one of the few districts still inhabited by the Wends, a branch of the Slavic population of Lusitania, who yet retain their distinct language, costume, and national characteristics. The numerous ramifications in which the Spree penetrates the woods and forests of this country before reaching Berlin are in the winter securely frozen over, when they take the place of roads, and are used as such even for funeral processions. Every one is, of course, perfectly at home on skates. So the young men, skating, take the ropes attached to the sleigh on which the coffin is borne, the old men, women, and children follow, skating, behind. The skates used are old-fashioned in character, tied with string. The men wear black coats and hats on such occasions, but the women vary their costume with white hoods, scarfs, and aprons.

BOHEMIA—A FUNERAL PROCESSION ON THE ICE

Skeleton Leaves.

E. D. Bartlett, in the *Optical Magic Lantern Journal*, reminds us of having in the long, long ago employed with much success skeleton leaves as lantern slides. The lantern is now much more than then used for educational purposes, and a set of skeleton leaves would form a valuable addition to an educational collection of slides. Mr. Bartlett recommends taking the green leaf from the tree, soaking it in rain water in a warm place till fermentation has destroyed the soft parts, and washing by a gentle stream of water till the fibrous network is clean. Heating in a suitable solution of caustic soda will very much shorten the operation. In fact, quite a number of skeletons may in that way be made in a single evening.

The Emotions of Animals.

Dr. Gibier has reported some valuable observations upon the physio ogical influence of the emotions in animals. The observations go to establish, as foreseen, that these effects of the emotions are identical with those of similar emotions in man. None the less is the demonstrative proof of this forecast both valuable and important. Its special importance is that in studies upon the lower animals, prosecuted with a view to ameliorating the condition of man, allowance must henceforth be made by all observers for moral effects. It seems that Pasteur, enlightened by the quickness of his sympathy with animals, has always made this allowance; but it is doubtful if all of his disciples have done so. Or, rather, it is not doubtful that often they have not. The evidence now adduced by Dr. Gibier being of a sort that appeals to their understanding, will avert one source of error that might vitiate their conclusions.

Darwin investigated the expression of the emotions in man and animals, demonstrating that similar impulses affected identical nerves, producing identical visible muscular phenomena. Dr. Gibier's demonstration merely extends the area of these observations, showing that those secondary effects recognized as morbid or disease effects are also identical in the different animal orders. Sir John Lubbock has added systematically to the immemorial observations that establish the reasoning faculty as existing in the lower orders. In all of these there is nothing essentially new. On the contrary, the substance of it all is old as the human record itself. Man has always, at least from his earliest records, recognized the essential kinship between himself and the rest of the animal kingdom. Indeed, the less sophisticated his own mind by his advance in civilization, the more distinct and frank is this recognition.

The knowledge, it appears, is lost only by a race that lapses from civilization to barbarism, carrying with it the sophistication of the higher state without recovering its clarity of vision. Thus when the Apostle Paul had to enforce spiritual truths on the acute generation of his day, he found it needful to impute to man a faculty or quality apart and additional to those shared with him by his "poor cousins" of the animal creation. Hence the words addressed by him to the Thessalonians, speaking of man as possessed of a threefold nature—spirit, soul, and body, the English words assigned as equivalents to those he used. "Spirit," here, is held to express an immortal nature capable of conceiving what is called an "abstract" right and wrong and God. "Soul" as here used means, according to the Rev. Lyman Abbott and the Rev. J. T. Conant, D.D., the lower or animal nature which man has in common with those whom he calls the brutes.

During his dark ages, European man lost sight of these earlier metaphysical distinctions, as he lost all other higher insight. In such an age, his natural vision closed to the natural facts plainly visible at one end of the human scale, to the savage in direct contact with nature, and no less plain at the other end to the enlightened mind, whether this repose on the observations of a pagan Pliny or the minuter researches of a Darwin, a Lubbock, a Pasteur, and a Gibier. Yet the attitude is that of ignorance merely, not of any dogmatic teaching, for the kinship is equally clear to a Paul, learned after the learning of the Greeks, and to an Abbott, learned after the learning of eighteen centuries later. The last, to express the facts of intelligence as common to man and animals, adheres to the English word assigned to this use by the translators of the Greek Scripture, "soul." To designate a different set of concepts, of attributes which both assign to man to the exclusion of all other animal orders, Dr. Abbott equally adheres to the translators, and uses the word "spirit."

The distinction is one essential to all intelligent expression on the subject, since its function is to discriminate the domains of verifiable and unverifiable knowledge. Unless this distinction be maintained in thought and speech, all converse on perhaps the highest and most interesting subject to which the human understanding can devote itself is reduced to vain babble of words.—*N. Y. Sun.*

The Steffens Process.

Many have inquired as to the object and operation of the Steffens process to be put in at the sugar factory here next summer. James G. Oxnard and N. R. Cottman have courteously furnished us with the following description, which will prove interesting:

Steffens' "Auscheidung" (extraction) process is a process patented by Mr. Carl Steffens for the purpose of extracting the sugar remaining in the molasses after the ordinary process now in use.

It consists in mixing fine powdered lime with the molasses in such quantities and under such conditions of temperature as will effect a chemical combination between the sugar and the lime by which a saccharate of lime is formed. This saccharate of lime precipitates from the solution in a solid form, and is recovered by passing the mixture through filter presses, the saccharate of lime remaining as a solid and the impurities of the molasses running off in a liquid form. This saccharate of lime is then dissolved in water or the beet juice and treated with carbonic acid gas, $C O^2$. The carbonic acid gas breaks up the chemical combination between the lime and the sugar, forming a carbonate of lime, which precipitates as a solid and liberates the sugar, which goes into solution. This mixture is again passed through the filter presses the carbonate of lime being caught in the presses, and the sugar, in the form of a solution, running off.

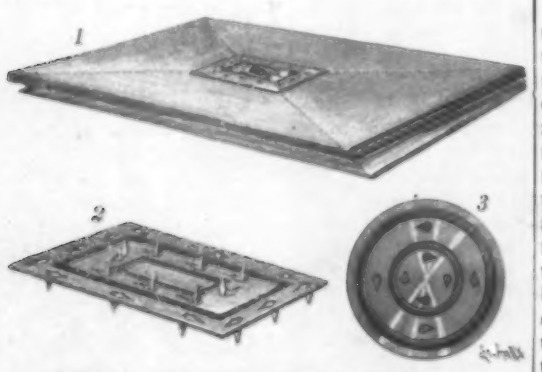
By this means we see we have first separated the sugar in the molasses from its impurities by combining it with the lime, then separated it from the lime by means of carbonic acid gas, giving us a comparatively pure sugar solution, from which we are enabled to extract the sugar by means of the vacuum pan and centrifugal machine. The molasses, while lime is being added to it in small quantities, has to be in iron vessels surrounded by cold water, as the chemical combination will only take place when it is at a very low temperature.—*Chino Champion.*

Jamaica Ginger.

Hidden away in a little official journal issued by the Jamaican government, which is probably seen by few but botanists, there is some interesting information about one of the chief export articles of the island—ginger. The Jamaican government has been somewhat troubled about the irregularity of the prices realized by this drug, and has set its tax collectors to inquire why the average price of the rhizome from the Manchester parish should be 16*s.* 9*d.* and that of the Westmoreland parish 60*s.* per cwt. The answers are generally that the want of care in the curing of the root is responsible for the low rates realized by much of the product. The green ginger, after scraping, should be kept from moisture, and daily exposed to the sun until it is perfectly hard: but these precautions are often neglected, the drug being dried while still immature, and put away damp into bags. Ratoon ginger is generally mildewed because it is harvested early in the season, when there is not yet enough constant sunshine available to enable the rhizome to be cured properly. The sharp, thin, narrow-bladed knives used for scraping—or, rather, paring—and peeling the ginger are specially imported for that purpose, and are known as ginger knives. When the rhizome has been scraped and peeled it is washed once or twice, and then dried on mats. In the Manchester district two varieties of ginger are grown—viz., yellow and blue—the former being the better grade. The name of "ratoon" ginger, which often puzzles dealers in this country, is applied to the root produced from the same piece of land after the first year's harvest has been garnered. These pieces of ginger (ratoons) left in the ground after the harvest are again dug up, season after season, until their market value falls below 16*s.* per cwt. locally, when they are no longer remunerative. The use of lime juice in washing ginger is condemned, as it is said invariably to cause mildew. An expert in ginger culture describes the industry as a curse to the island, which should be abandoned—the sooner the better. Virgin soil is in constant demand for ginger growing, but the exhausting effects of the crop on the soil and the wholesale destruction of valuable timber in forest land (fire being the only agent for cleaning up) can only be realized by visiting growing districts and observing the dried-up streams, the clearance by fire of thousands of pounds' worth of timber, and the impoverished soil, which will only grow ferns afterward. A howling wilderness marks the progress of ginger culture in every direction and £20 worth of ginger is the outcome of ten times the value of other material destroyed.—*Chemist and Druggist.*

A METALLIC SEAL FOR ENVELOPES, ETC.

The device shown in the illustration affords an effective locking means whereby the contents of an envelope and the stamp may be so secured to the envelope that the latter cannot be opened or the contents tampered with without injury thereto. It has been patented by Mr. George F. Lemmon, of No. 32 N. Cleveland Avenue, Canton, Ohio. Fig. 1 shows the application of the improvement, and Fig. 2 one of the fastening plates, Fig. 3 representing another form of such plates, which are preferably made of aluminum or some light metal. Each plate has a series of prongs struck up and bent in reverse directions, the prongs at the outer edges projecting downward and an inner



LEMMON'S FASTENER FOR ENVELOPES, ETC.

series projecting upward, while there are grooves inside of each series of prongs. The prongs preferably have serrated edges, and the plates are usually employed in sets or pairs, two plates being clamped together, but having their prongs and grooves so arranged as to be alternately disposed when laid together. The inner plate is first secured by its prongs to the letter, and the latter with the outer prongs projecting is inserted in the envelope, to the rear side of which the prongs are clamped. The flap is then folded down, the other plate laid over the folded edge and in register with the inner plate, the stamp forced over the center outwardly projecting prongs, and the whole compactly pressed together in any suitable handpress. The plates thus used do not mar the face of the envelope, and the use of sealing wax, gum, etc., may be dispensed with.

BURNHAM'S 13 INCH DRILL PRESS.

Prominent among the many strong features of this excellent drill, which is made by the George Burnham Company, of Worcester, Mass., is the center shaft independent of and belting to the base of the drill, doing away with all jar or shaking caused by unevenness in the belt. This system imparts a perfectly steady motion to the spindle, and the belts being long, give great power while running quite loose. The tension of the belt is never on the spindle. The table can be brought to desired position by the screw, as shown in cut. The screw is No. 3, double thread, and

13 INCH DRILL PRESS.

gives a rapid motion to the table, which is free to swing either way. A bell center is provided for center drilling and reaming. The capacity and dimensions are as follows: Will drill a ⅝ inch hole to the center of a 13 inch circle, 4½ inches deep, without moving the table. Greatest distance from spindle to table, 36 inches. Table is 11¾ inches in diameter. The drill has steel rack and pinion. The spindle is made of the best crucible steel and is reamed with Morse taper No. 1. Spindle is counter-balanced with a coiled spring which can be adjusted to any degree of sensitiveness. The column, which is 4½ inches in diameter, has a center line the entire length, and a pointer on the table arm will bring the center of the table exactly under center of spindle. They also manufacture a two spindle drill having two heads 10 inches apart, the size of the table being 12×22 inches; and a three spindle drill with three separate heads 10 inches apart. The two outer spindles will drill to the center of a 22 inch circle and the middle one to the center of a 13 inch circle. The table is 12×32 inches.

Two Kinds of Memory.

From careful observation and deliberate reflection upon the facts observed, the writer is convinced that there are at least two radically different forms of memory, neither of which is convertible by effort or education into the other; and that these forms of memory are seldom present in like degree in the same individual, one form in fact being often very feebly marked where the other is unusually prominent. In the early years of school life the child awakens to the fact that some members of his class have great facility for learning by rote; yet experience shows that these members are often distanced in the final examinations by competitors whose power of learning by rote is very slight; and still greater experience will often prove that these pupils of "rote" memory do not become the most useful or successful citizens. Every medical school, perhaps, boasts its professor whose "wonderful memory" enables him to roll out great strings of complicated therapeutical formulæ or to tell with a flourish on what side of a particular page and how far down its column a statement quoted is to be found. Yet this professor is very probably inferior in breadth of thought and in originality of practice to some colleague who occasionally in lecturing forgets even simple formulæ and confesses that names of authorities often slip his memory most unexpectedly.

It has been the fashion among educators, and with the public as well, to honor greatly the former sort of memory, giving prizes to the pupil who can learn by rote with the greatest facility. In fact, the histories and geographies of thirty years ago seemed to be specially constructed for showing off the merits of this form of memory. Even now the public feel a grudge toward the man who does not recognize the casual acquaintance of a week ago when he passes him on the street. As far as can be judged by one who possesses this former sort of memory in very feeble degree, it is dependent upon a process, somewhat akin to photography, by which the details of objects presented to either the physical or the mental eye are fixed in outline upon the sensorium. Recollection consists in turning the mental gaze upon the photograph thus recorded. It is said of a certain artist, famous as an illustrator of books, that after driving through a park he could at will picture to himself the grouping and individual outlines of the trees which he had passed. The writer knows a little boy who, when about five years of age, would draw from memory a picture of a railway locomotive with details of outline which would be doubted by his elders until investigation proved that they represented minor portions of the engine. Other instances of the development of this "photographic" memory *pari passu* with the earliest unfoldings of a child's perceptive powers will occur to the observant reader.

The second form of memory may be termed "logical." It appears less brilliant to the casual looker-on. It is apparently developed later; not because it is not, like the other, inborn in the structure of the mind, but because the reasoning faculty is developed more slowly than physical sight. Compared with "photographic" memory, it has *color*, which sometimes obscures detail of outline. The possessor of "logical" memory places little value upon naked facts or figures, but appropriates such as have important bearings, which can be perceived, upon other facts of known value. In moments of leisure his mind is engaged, not in roving at random over the impressions of the past, but rather in working out the relations between certain isolated things observed and deducing conclusions from these relations. These abstract processes of thought make him inattentive to many details in his present surroundings which would be impressed upon a "photographic" memory. As reflection is a higher faculty than observation, so the "logical" must be superior to the "photographic" memory. This becomes evident also if we compare the man of "logical" memory, who has well founded opinions of his own, with the man of "photographic" memory who can give only the opinions of other persons, or the mature historian with the small-talk conversationist.

Both varieties of memory should be cultivated, for the best memory is that in which both are present in due proportion; but the average mind does not, in its original constitution, embrace both in equal degree. It is obviously unfair to punish the school child who possesses a well developed "logical" memory because he has not equal "photographic" perceptions; and it is unjust to brand the man of "logical" memory, who offers fine reasoning powers and stores of well-ordered facts of value, as one who has "a miserable memory," simply because he occasionally overlooks unimportant details.—*N. Y. Med. Jour.*

IMPROVED TEA AND COFFEE STRAINER.

The simple little device shown in the illustration has many points to recommend it, and its usefulness cannot fail to be recognized at a glance. It is attached to the spout of a tea or coffee pot by simply pressing the thumb pieces together, and can be readily adjusted upon a spout of any size. It does not drip to soil the linen, and its sieves are easily removed for cleaning. The clamp for coffee or pitcher nose spout is a slight variation from the one shown in the illustration, and these novelties have been patented. They are manu-

IMPROVED TEA AND COFFEE STRAINER.

factured by the Standard Strainer Company, No. 36 Maiden Lane, New York City, in nickel and silver plate and in solid silver.

The Pasteur Institute.

The annals of the Pasteur Institute for the year 1893 have just been published. They show that last year 1,648 persons were treated for hydrophobia, and that only six of them died of that disease. Of the number mentioned, there were 1,470 French people and 178 foreigners. Among the foreigners were 43 Spaniards, 35 Greeks, 23 English, 22 Belgians, 18 Egyptians, 14 British subjects from India, 9 Swiss, 9 Dutch, and 6 Portuguese. Since M. Pasteur commenced to practice his inoculations against hydrophobia 14,430 persons have been treated by his method, and 72 have died of the disease.

THE PARK AVENUE IMPROVEMENT IN NEW YORK CITY.

The Grand Central Depot, at the corner of Fourth Avenue and Forty-second Street, in this city, is the main railway terminus on Manhattan Island. It is reached by four tracks on the line of Fourth Avenue, running south from the Harlem River. The tracks start from the street level at the Grand Central Depot, the entire region about the depot being given up to the track yard, round-houses and other structures appertaining to the railroad service. A few blocks above Forty-second Street the streets crossing Fourth Avenue are provided with bridges, but for a space of several blocks Fourth Avenue cannot be crossed. At about Forty-ninth Street the tracks begin to be depressed, and up to Ninety-eighth Street they run virtually in a tunnel, over two miles long. This leaves the street above unincumbered. The avenue is 140 feet wide, and through its center and above the tunnel are a series of little parks, whence the name of Park Avenue has been given to it. Trains passing through the tunnel have an unobstructed track and do not reach the ground level until they get to Ninety-eighth Street. Here the street grade falls rapidly and the car tracks are carried on an elevated viaduct of stone and earth filling. At 100th Street the work of the Park Avenue Improvement Commission begins. It consists in making connections to and in building a four-track elevated steel viaduct from 110th Street to Mott Haven, where the tracks gradually run down to the depressed road in the annexed district. The general aspect of the finished structure is shown in Fig. 3.

The way is carried on three rows of lattice steel columns, each row supporting plate girders. The intermediate cross trussing is provided by the flooring, besides which there is a transverse lattice girder for each set of columns. This is arranged on the solid floor system, now in extensive use by the New York Central Road on its bridges. A cross section of it is shown in Fig. 6. It virtually consists of a series of three-sided box girders built up of steel plates and angle irons. The plates are three-eighths inch thickness, and the depth of the vertical plates averages 18 inches, with a width of 14 inches. The channels thus formed are open alternately above and below, and cover the entire area with a water-tight floor. From center to center of cross space the distance bridged by the girder floor is 28 feet, giving a total width of floor of 56 feet, a plate girder running along each side and one through the center. The girders are 7 feet 2 inches deep, and the webs are of ⅜ steel for the side and 9-16 for the center girders. From center to center of columns is 65 feet.

The street beneath the viaduct will be graded and paved, and is to be thrown open to the public, leaving the full width, 140 feet between house lines, open and unobstructed, except by the three rows of columns. The Harlem River is to be crossed on a four-track high level bridge, with a center pier drawbridge. Immediately across the river Mott Haven is entered, and here an elevated level station is to be built. The Harlem River bridge is shown in Fig. 4, the Mott Haven station in Fig. 1.

One of the purposes in carrying out the improvement is to free the street from the incumbrance presented by the stone viaduct and to do away with bridges at street crossings. This is an object of such importance as to justify the city in paying a part of the expense. The use of an elevated bridge over the Harlem River is also one of the most important features of the work. The river in question is a legal waterway open to navigation. A low drawbridge, such as in use at the present time, is not only an obstacle to vessels, but the necessity for its periodical opening has interfered with the running of the trains. The new bridge is to be so high that the majority of vessels using the Harlem River can pass under it. Thus, while it can be opened, it will be rarely that the necessity for doing so will arise. The bridge, by its high level, will at once improve the conditions of railroad and river traffic.

The system of carrying out the work without disturbance of traffic remains to be described. In Fig. 5 is given a view of the work of erection looking north from 107th Street. Here the operations include removal of the viaduct now carrying the roadbed and its replacement by the new structure. Temporary wooden trestle work is to be built on each side of the present viaduct and on this the trains are to run reaching the grade of the old road at about 115th Street. This leaves the ground clear for the demolishing of the old and erection of the new viaduct. When 115th Street is reached, where the tracks begin for part of their extent to be depressed, another system is adopted. The side columns are put in place, as shown in Figs. 6 and 7. But the tracks being all occupied, it is impossible to put in the center columns. Accordingly wooden trusses are to be thrown across from the lines of the side columns, and resting on the old retaining wall, and these trusses provide a center bearing for the center longitudinal girder. In this way, as also shown in Figs. 6 and 7, the full permanent flooring is sustained by side columns and temporary transverse trusses. The trains at this stage can run over the new tracks, definitely abandoning the old. This leaves the ground clear for work. The center piers will now be built, the columns will be erected on them, and after the columns are in place the wooden trusses will be removed.

This procedure it will be observed is adopted to keep four tracks in use. But the temporary Harlem bridge will be a two-track structure. For a short distance below it, therefore, the four tracks are merged into two lateral ones, as shown in Fig. 2. This leaves the scene unobstructed, and the viaduct can be built at this place without any special methods of construction.

The sequence of the improvement provides, as said, for a four-track elevated level bridge over the Harlem River. This in itself will be an innovation, and will be the only four-track bridge of this description in the world. To enable it to be built without interruption of traffic, a temporary viaduct with a draw-opening has been erected to the westward. The tracks will pass over this structure while the main bridge is being erected. The temporary draw of the hinged type, swung from horizontal to vertical position when opened, is quite peculiar, and in itself is an object of interest. It was about a year ago moved bodily from its position on the line of the old bridge to its new location to the west. We illustrated in the SCIENTIFIC AMERICAN of December 31, 1892, this operation, one of remarkable interest, as being performed without interruption of traffic. The same illustration may be referred to as showing the old and new lines of road, the one where the new bridge is to go, the latter for temporary use during the improvement.

In Fig. 8 we show the relations of the old to the new. The locomotive is on the old tracks. Along the line are seen the side columns, whose bases are on the street grade, and the side girders, marking the viaduct bed, are seen resting on the columns.

The trussed flooring is to be riveted by means of angle clips to the longitudinal central and side plate girders. The rails are to be clipped to the flooring without sleepers, sound-insulating or deafening pads being placed beneath them.

The steel structure is supplied by the Elmira Bridge Company and the New Jersey Iron and Steel Company at a contract price of $1,500,000. The masonry work of the piers, it is estimated, will cost $100,000; the temporary work, $100,000; the Harlem pier bridge, $1,000,000; and the work at Mott Haven, $500,000. This aggregates over $3,000,000, of which amount the city of New York is to pay $750,000.

The work is in the hands of a special commission appointed by the Mayor, under a special act of the Legislature. It is entitled the Board for the Park Avenue Improvement above 106th Street, and includes the following members: John Fox, president; James H. Haslin, secretary; Walter Katte, superintending engineer; Almerin H. Lighthall; Peter F. Meyer.

Cotton Mills in Egypt.

In Consular Report 162, lately issued, is a report on this subject by Frederic C. Penfield, U. S. Consul-General at Cairo, in which he says:

The success which has attended the establishment of mills in the United States and other countries in the neighborhood of cotton fields has suggested to capitalists the practicability of trying the experiment in Egypt of fabricating the native cotton to clothe the people of the country. A company is forming with English and local capital to establish at Cairo a factory of about 18,000 ring spindles and 500 looms of the newest and most approved make, and if the venture prospers, it is proposed to establish mills at Alexandria and other points.

The Cairo factory will be under English management, and will be equal in many respects, it is promised, to the most modern and best equipped factories in England. An authorization for the undertaking has been granted by the Egyptian government, and assurances have been given that every encouragement will be afforded the new industry.

The demand for cotton cloth in Egypt is large and constantly increasing, while Cairo is a distributing point not only for Upper and Lower Egypt, but also for the supply of cotton goods to the adjacent countries. Egyptian cotton, both brown and white, is well known to be of excellent quality and can be delivered in Cairo at a much lower price than in England; the rate of wages is also much lower. The Egyptian workmen are clever and easily taught, and the supply of suitable labor is ample.

In addition to the cost of freight and forwarding expenses on all goods coming into Egypt from Europe, there is a duty of about 8 per cent ad valorem payable on all imported goods. These charges will be saved on the homemade production, as well as the original one per cent paid on the cotton when it was shipped from Egypt. This saving, coupled with the suitability of the climate and the abundance of good labor, furnishes evidence of the practicability of the undertaking.

The site of the proposed factory is in the immediate vicinity of the Nile, whence water for all purposes will be obtained, and the river can also be used for the conveyance of coal and cotton to the mill. A railway runs near the factory, and a branch line of rails can be extended into the grounds, thus giving direct communication with all the railways in the country.

With a population of between 7,000,000 and 8,000,000 people, in a climate where garments of wool are worn but a few months in the year, the project theoretically has much to commend it; and with intelligent and prudent management this venture may be the precursor of a movement that will make the people of Egypt independent of England for their fabrics, for Manchester's looms now supply more than 90 per cent of the textiles coming into the country. The enterprise should render its projectors a fair measure of profit and at the same time give the Egyptians the advantage of a saving in the cost of their clothing, and illustrate for the benefit of other nations whether Egypt offers a medium for the profitable employment of capital in cotton working.

Enameled Bricks.

Some thirty years ago the Farnley Iron Company and one of its neighbors in business at, or near, Leeds, England, finding that the fire clay found in connection with the coal seams in that district was particularly suitable for allowing an enamel surface, began the manufacture of glazed brick. For some years after the trade was started the brick made were very inferior, compared with those of the present day, the best brick of that day not being at all equal to what are sold as second quality now. Notwithstanding this, the brick found immediate sale with architects, especially in London, where they were used partly for sanitary reasons (the glazed surface being washable and non-absorbent) and partly for light afforded in narrow alleys and courts. As the quality of the brick improved with the experience of the makers, the demand still further increased, and they are now used in large quantities in all English cities. It is estimated approximately that the total output capacity of the Leeds district is about 4,000,000 to 5,000,000 per week. Of these numbers not more than sixty per cent can be reckoned on as first quality and thirty per cent second quality; the remainder, as thirds, are available only as building brick. These thirds are valuable where strength is required; the superior clay and hard burning make them of high value, because of their resistance to crushing loads.

It is worthy of note here that in placing enameled brick where they are to be subjected to heavy loads, care must be used in setting, that the superincumbent force does not press on the outer edge of the brick, as the enamel will give way if more than its share of the load is imposed upon it.

Probably about one-sixth of the product of the Leeds factories is shipped and used in America, where they may be said to be the standard for good, serviceable enameled brick, and the excellent quality to which they have attained must be equaled by our American manufacturers before they can justly claim to have first quality glazed brick.

It is a pleasure to be able to state that at this time there are, at least, two American manufacturers who have nearly attained to the excellence of the best English makers; in fact, they do equal them in the durability of this product, their success in getting clays and glazes to fuse being fully up to the English; and the only difference in the American and English brick is that our manufacturers have thus far failed in finding a clay with all the necessary qualities that will, after burning, have a surface as smooth as is the product of our English friends. The only American manufacturers who have thus far succeeded in making a thoroughly good and merchantable glazed brick from the standpoint of the English standard are the Griffen Enameled Brick Company, of Oaks, Pa., and Sayer & Fisher Company, of New York. The experience of our American, as well as the English manufacturers, in getting the manufacture of glazed brick started on a successful basis has been fraught with many sad experiences, and with them, as with the makers of other kinds of brick, the working of clays and enamels has been "eye openers," and in all cases success has only been attained at a great cost in money and vexation of spirit.—*G. B. Engle, Jr., before the National Brick Manufacturers' Association.*

Prize for a Paper on Paint.

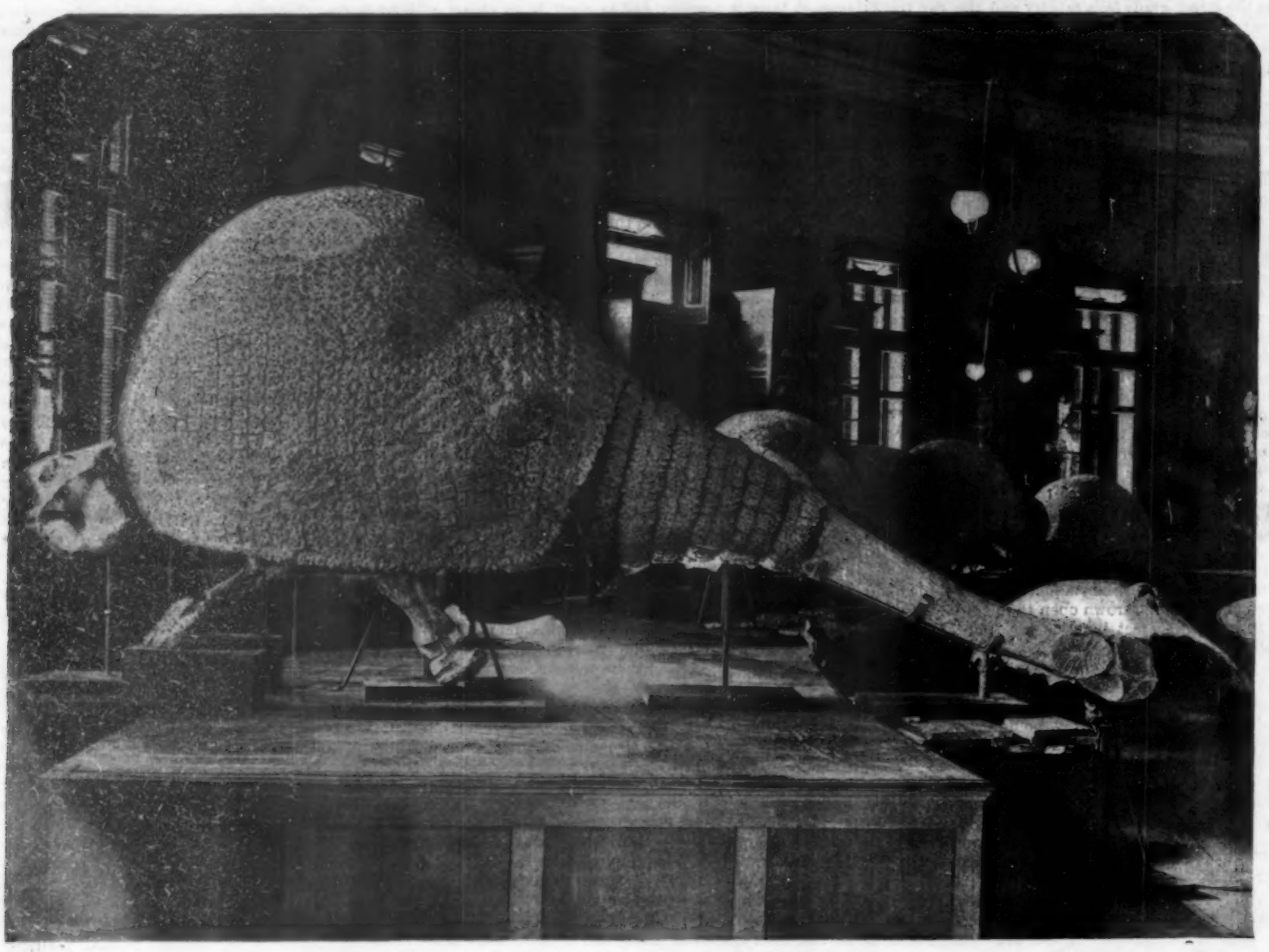
The Verein zur Beforderung des Gewerbefleisses, of Berlin, is offering a silver medal and a prize of £150 for the best paper giving a chemical and physical analysis of the iron paints mostly employed. Very little definite information is known regarding the application, duration, effect, etc., of these paints, and the papers above invited should contain (1) a description and classification of the paints mostly used, based on a chemical analysis. (2) A statement of the materials and mixtures which form the most suitable paints for application to all kinds of iron. All competitions are to be sent in by 15th November next.

THE Singer Manufacturing Company was incorporated in 1863, when 21,000 machines had been made, and now the manufacture has risen to 12,000,000.

THE GLYPTODONT.

We are indebted to *Knowledge* for the following and for our engraving, which is from a photograph taken in the museum of La Plata. During life the animal was covered with a sparse coating of bristles, which came through the holes in the plates of the carapace, and seem to have been as thick as a porcupine's quill, while they were probably several inches in length. The oval, depressed, rough disks at the end of the tail carried, during the existence of this glyptodont, huge horns, probably very like those of an African rhinoceros. Just behind the extremity of the tail is seen the carapace of another glyptodont with a crater-like aperture over the region of the pelvis; while still further in the background are a long row of carapaces belonging to other genera of the group.

In this stupendous monster, which measured upward of eleven feet eight inches in a straight line, the carapace is characterized by its peculiar humpbacked form, while its margins lack the prominent knobs characterizing those of the preceding group. On closer examination it will be found that each of the component plates of the carapace, instead of being polygonal and marked by a rosette of lines, is rhomboidal and pierced by from two to five large circular holes. From the analogy of the living hairy armadillo—known in Argentina by the name of peludo, or hairy animal—it is quite evident that during life the holes in the plates of the carapace of the extinct monster, which, by the way, may be known as the "club-tailed glyptodont," or technically as *dadicurus*, must have formed the exits of large bristles, which were equal in diameter to a cock's quill, and were doubtless many inches in length. The whole body of the animal must, therefore, have resembled a gigantic porcupine. Still more extraordinary is the conformation of the huge tail, which had a length of about five feet. At its base this appendage was encircled by about half a dozen double bony rings, nearly as large at the base as the iron hoops in the middle of an ordinary beer barrel; their component plates being pierced by the aforesaid holes for bristles. The whole of the terminal half of the tail is formed by one continuous piece of hollow bone, which, if we exclude whales, is one of the most massive bony structures in the animal kingdom, and is almost as much as a man can lift. Starting at its base in the form of a nearly cylindrical tube, this sheath rapidly expands at the sides and becomes flattened on the upper and lower surfaces, until at the tip it finally assumes the form of a depressed flattened club, which would have formed a most efficient weapon for a giant. Along the sides of its extremity this club is marked by a number of oval depressed disks, showing a sculptured pattern of ridges and grooves radiating from the center, and some of them attaining a length of six or seven inches. From the structure of their sculpture it is quite evident that during life these disks must have formed the bases of huge horns projecting at right angles to the tail, which must thus have formed a veritable chevaux-de-frise. If, as is quite probable, these horns were as long as those of the common African rhinoceros, the tail of the dædicurus must have presented a most extraordinary appearance as it dragged on the ground behind its owner (for it is impossible to believe that any muscles could have raised such a stupendous structure). The use of these horny appendages is, however, hard indeed to divine, since the creature was amply protected by the underlying bone; and it is therefore probable that they must come under the category of ornamental appendages. Be this as it may, with its bristle-clad body and horned tail, the club-tailed glyptodont may well lay claim to the right of being the most extraordinary-looking creature that ever walked this earth during the whole duration of the tertiary period.



THE CLUB-TAILED GLYPTODONT. (About one-fifteenth the size of nature.)

Effect of Light.

Some remarkable effects of light have been observed by Mr. F. Elfving, and are described by him in the journal of a Finnish philosophical society. It is stated that if platinum or burnished steel is exposed for some time to direct sunlight, the sun creates in them a condition which, though otherwise imperceptible, manifests itself by the fact that the body has a powerful attraction for the hyphæ of a particular plant, *Phycomyces nitens*, well known to every plant physiologist. This power appears on the illuminated as well as on the opposite side of the body, and lasts for some hours.

The phenomenon is somewhat mysterious, but is not altogether without analogy. It is a well known fact that a number of non-luminous bodies, after being exposed to illumination, emit light in a manner commonly described as phosphorescence. Metals do not belong to the phosphorescing bodies; but in the case in point a kind of phosphorescence seems to occur, which is not visible to our eyes, yet takes effect upon the plant structure. The phenomenon might be designated dark phosphorescence, and the possibility of it was foreseen by E. Becquerel. The effect was produced by exposure to direct sunlight only, not to cloud light, and that it was due to light and not to heat is proved by check experiments, in which no similar result was produced by steel and platinum plates heated for hours to the same temperature. The ultra-violet rays of the sun have no particular share in causing the phenomenon, which is interesting as showing that mere exposure to light in some way alters the condition of certain metals without showing any sign to the eye.

British Soldiers Must Not Take Patents.

The British commander-in-chief, with the approval of the secretary for war, has lately issued the following regulation with regard to patents for inventions:

"All officers or subordinates holding staff appointments or employed in any administrative, instructional, manufacturing or experimental department under the war office are to understand that one of the conditions subject to which they hold such appointment or employment is that they shall not take out a patent or seek for provisional protection for an invention without first obtaining the approval of the secretary of state for war, by application through their respective commanding officers or heads of their departments. Each application must contain a general description of the invention for which protection is desired. Permission to patent will not be granted as a matter of course, but each application will be dealt with according to the circumstances of the case. Should permission be granted, it will be subject to the following conditions, from which there shall be no appeal by the patentee, either to the treasury under section 27 of the patents act, 1883, or otherwise. (*a*) That if it be at any time desired by the secretary of state, the patent shall be absolutely assigned to him upon such terms as, after full consideration of all the circumstances of the case, he may decide upon. (*b*) The invention may be used by or for Her Majesty's service, and that terms of payment, if any, for such use, shall be decided by the secretary of state. (*c*) In settling terms, either for assignment or use, regard will be had by the secretary of state to any facilities in originating, working out and perfecting the invention which the inventor may have enjoyed by reason of his official position; and all payments will be subject to the approval of the treasury."

In the United States any person in government employ, soldier or sailor, is free to take a patent for any invention he may make.

Curiosity of Plant Life.

It has been long known, and considered very curious, that the two lobes of the leaves of the Dionæa—the Venus flytrap—will close over and capture an insect that alights on the leaf, and more recent study shows that the plant really eats the insect it captures. But little is yet known of the nature of the mechanism by which it is enabled to do such marvelous work. Dr. J. M. Macfarlane has recently discovered that leaf blades

Fig. 3.—CRYSTAL CASE WATCH MADE BY JEAN ROUSSEAU, ABOUT 1675.

will not respond to a single touch. No matter how severe a single stimulus may be, the blades will not close. There must be a second stimulus before an attempt at closing is made. But even here the stimuli must have an interlude. If the two stimuli follow closely, no response follows. Dr. Macfarlane finds that there must be a period of nearly a minute, fifty or sixty seconds, between the two. There is, however, some variation under different temperatures. The effect of the first touch or stimulus will be retained for some

Fig. 6.—NURNBERG EGG, MADE ABOUT 1550.

four minutes. The second excitation, if made after that, stands as an original motion, as a parliamentarian might say. Those who are fond of speculating on the "motives" of plants will see in this a wonderful provision of nature, more wonderful possibly than anything that has yet been brought out in connection with plant life. Knowing now, as we do, that the leaf closes on the insect for the purpose of eating it, there should be some way of discovering whether that which alights on the leaf's surface is eatable or not. It has no eyes to see with, so it cannot tell whether it is a piece of wood, stone, or other inorganic material that is tempting it, as a living creature could. Such material falls, and remains still on the leaf. But an insect struggles, and by this struggle the plant receives intelligence that it is a living thing. Here also may be seen the advantage of a brief interlude between the stimuli; a piece of gravel might rebound—might make two stimuli close after one another. An insect would wait a short time to collect its senses, and formulate some plan of escape. It is very clear that this ability to discern between the animate and inanimate saves the plant from a great amount of useless labor. The discovery of Dr. Macfarlane is probably the most wonderful of all wonderful things that have been discovered in the behavior of plants. Mr. William Canby had already discovered that if a leaf had been "fooled" into closing over a piece or inorganic matter, it soon opened and let it out again. Dr. Macfarlane finds that when it catches an insect, it remains closed over it for twelve or fifteen hours—long enough to consume it. It takes eight or ten hours after an insect is caught before the acid—which in Drosera Mr. Darwin found analogous with pepsin, the leading destructive element in the gastric juice—flowed evenly over the whole surface of the leaf. The leaf surface is subject to stimuli equally with the hair.—*The Independent.*

NOTABLE AND CURIOUS WATCHES.

The display of watches in the Swiss section at the World's Columbian Exposition formed the most conspicuous part of the exhibit of that country, and consisted largely of watches of high grade movements in cases set with precious stones or ornamented with enamel and other high class work. There was also an interesting exhibit showing the progress made in horology. The exhibit of Patek, Philippe & Company, of Geneva, was especially rich in historic watches, of which the following formed part.

Fig. 1 shows the first known watch. The outer case, which contains the movement, is represented as open, so that the dial can be seen. The peculiar key used to wind the watch is shown at the side. This watch was made in 1074 by Hassan Emin. Nothing further is known of the watch, or who Hassan Emin was, or where he lived. That he was a most excellent watch-maker is shown by the remarkable quality of the work in the movement. The case is of bronze, worn and indented by age, and is cracked in places, one crack near the hinge being shown in the illustration.

Fig. 1.—WATCH MADE BY HASSAN EMIN, IN 1074.

It is evident the outside of the case was originally ornamented in elaborate Arabic designs, but this ornamentation is nearly all worn off, and the fire gilt which covered the case has disappeared, except in the depressions, where it is still bright. The figures on the dial are also in Arabic. There is one hand, and this is heavy, giving the watch much the appearance of an inexpensive compass. In the back of the case is a hole through which the key is passed to wind the watch, and the key, as seen in the illustration, is of the crank style so extensively used not many years ago in winding the old-fashioned weight clocks. The movement can be taken out of the case, and, when examined under a glass, is found to be in a fine state of preservation. The wheels are engraved in Arabic designs and the whole movement is of brass, protected by a very fine quality of fire gilding. No gold was used in the watch proper, and there is no silver further than the plate on the back of the movement, which is elaborately engraved with Arabic designs. The movement has a fusee and string, without any other timing device than a pin fastened to the bridge, and on which the balance bars beat. The face is elaborately engraved and the movement is complete, so that the watch runs when wound up.

Fig. 2 illustrates one of the first striking watches ever made. This specimen bears the name of Quare, of London. It is a curious and rather rough piece of mechanism, which is now incomplete. There is no date on the watch, but it is supposed to have been made about the year 1600. The outer case is made in open work design, so that the sounds from the striking device may be emitted. The numerals on the dial are like those used at present. The dial is of silver, and, like all watches of early date, there is only one hand. The movement appears to have been practically the same as that used to-day; but the incompleteness of the mechanism makes it impossible to describe it fully.

Coming down to a later period, we have a remarkable specimen of horology in the watch shown in Fig. 3. The case is of quartz crystal, cut in the shape of a cross in a most perfect manner, the corners being beveled with the exactness of machine work. The two sections of the case are held together by a gold clasp, and the inside is hollowed out of the crystal to admit of placing the movement. The case opens and turns on a hinge at the top and the movement is reached by lifting it out of the cavity in which it fits. The movement is made in the irregular shape of a cross and is of the fusee and chain design, without hairspring or other timing device. All the gold work is elaborately engraved. The shape of the watch shows the ecclesiastical tone of the age in which it was made and the motive of the engraving is in keeping with this same spirit. The watch is in excellent running order. It has much historic interest, as it was made by Jean Rousseau, greatgrandfather of the famous philosopher. It was made somewhere about 1675, and is especially mentioned in the inventory of the property of its maker. This watch has been on exhibition in Geneva for a great many years, and the face of the crystal has been somewhat scratched by constant dusting, but the back remains finely polished.

Napoleon's watch, shown in Fig. 4, is scarcely a century old; it is in a fine state of preservation. It was made in Paris, and has the modern bridge verge escapement and is in excellent running order. The engine turning on the back of the case is quite sharp, and is peculiar in that it starts on an eccentric from near the bottom, instead of from the center. The movement is in the shape of a Grecian urn, and the dial is on the face of the urn. The watch is owned in this country. An interesting bit of history attached to this watch is that when Napoleon was campaigning in Holland, and was out driving, the horses became frightened and were about to dash into a river, when a man sprang at their heads and stopped them. Napoleon offered the man money, and, when this was declined, political position. The man also declined this. Taking this watch from his pocket, Napoleon gave it to him, telling him to keep it to remember the circumstance by.

Fig. 5 shows what can be accomplished by a combination of ingenuity, skill, and persistency. It is a watch made almost wholly of wood, by a watchmaker who was convicted of some crime and sent to Siberia by the Russian government. The convict made this watch to while away his time, and was pardoned because of his work. The only tool that he had to work with was a penknife. Irregularity in the work can only be discerned by examining it with a glass. Nevertheless, it is remarkably accurate, and the watch runs and keeps fair time. The wood used was boxwood. The numerals on the face are small pieces of

Fig. 5.—WATCH MADE ENTIRELY OF WOOD AND IVORY.

ivory, inlaid. The dial wheels are of ivory, and are set on the face of the dial. The hour, minute, and second hands are of tortoise shell. The second dial is recessed on the lower part of the main dial. The wheels and plates of the movement are of wood, while the pinions, balance, cylinder and escapement wheel are of ivory. The ratchet spring is of wood. The plates are held together by wooden pins and the balance bridge by ivory screws. The key with which the watch is wound is made of wood with an ivory tip, and is made like a modern ratchet key. The winding "square" is of oblong shape.

This ingenious watchmaker also constructed the box in which the watch is contained. All the joints are perfect, so that the box is practically dust proof. Little is known of this convict further than that his name was Tagansog.

A large watch having a striking mechanism, and known as the Nurnberg Egg, is shown in Fig. 6. It has no hairspring. Pins are provided as a timing device to accelerate or make the balance run slower. There is a fusee with a string. It dates about 1550, but there is no name or inscription giving its date or origin.

The Carbon Telephone Patents.

There have been many inquiries as to the patent situation in the telephone art. There is a general apprehension that the American Bell Telephone Company has the art bottled up in some mysterious way, but why or how the general public does not seem to understand.

The Berliner and Edison patents have been published in full in this journal in the issues for November 28, 1891, and May 14, 1892. As stated in a brief *resumé* of the situation in the *Electrical Review* for March 21, 1894, magneto telephony is open to the public, and, for short line work, this will undoubtedly be found to answer sufficiently well. For local service, as between the several rooms of a building where outside noises do not interfere to any considerable degree, simple magneto instruments connected to a wire strung through the several rooms, provided with a simple push button and bell, will be found to give good service. As such instruments of the standard Bell make can be bought for a low figure, those who would be satisfied with this style of service can easily install their own equipments; but in cases where there are interfering noises magneto instruments of ordinary construction, when acting as transmitters, cannot be expected to yield satisfactory service, and this is where the variable pressure patents of Edison and Berlinger cut an important figure. For the benefit of such of our readers as may not know the scope of the claims in these patents we will refer to them briefly.

Patent No. 474,231, granted to Thomas A. Edison, May 3, 1892, contains the following claim:

"In a telegraphic apparatus operated by sound, the combination with the diaphragm of one or more contact points of plumbago or similar inferior conductor in the electric circuit, whereby the rise and fall of electric tension is proportionate to the pressure exerted upon the said point or points by the diaphragm, substantially as set forth."

The invention contained in this patent was patented in a number of foreign countries—England, Canada, France, Belgium, Austria-Hungary, Italy, Germany, Spain, and Russia. Under Revised Statute 4887, "every patent granted for an invention which has been previously patented in a foreign country is limited to expire at the same time with the foreign patent, or if there be more than one at the same time, with the one having the shorter term."

The term of the British patent is 14 years. The British patent, therefore, expired July 30, 1891. It will be maintained, however, in the interest of the Edison patent and of the Berliner patent, hereinafter more fully noted, that the ordinary construction of the above quoted statute is not a proper construction, and that the words "previously patented" in the statute mean not previously to the date of the United States patent, but previously to the date of the United States application, and the application was filed in the United States Patent Office July 30, 1877. This matter as to the meaning is pending in the Supreme Court of the United States, and is expected to be heard in the fall. It has been said that the American Bell Telephone Company and the General Electric Company, both of which have great interests at stake in the decision, are, in reality, defending the case. What the decision will be cannot, of course, be prophesied. The almost universal construction heretofore put upon the language of the statute is that the term "previously patented" means that the date of the foreign patent is prior to the date of the United States patent. Under this construction the Edison patents would be void, having in reality expired before they were granted. Those who are contemplating using carbon telephones, however, should bear in mind that the question is not definitely settled, and will not be until the Supreme Court renders its decision. It will be noted, however, in looking at the Edison claim, that it covers only two electrodes which contain one or more contacts of inferior conducting material, upon which the pressure is varied by the motion of a diaphragm. Now there is a clean cut class of carbon transmitters that would not seem to fall within the scope of this language, namely, a modification of Hunning's, wherein carbon granules may be placed loosely in a receptacle which is vibrated by the action of the diaphragm, and the resistance of which varies during the motion of the diaphragm merely by the shaking up of the particles. A transmitter of this type has been recently patented by an enterprising inventor outside of the Bell fold.

The Berliner patent contains the following claims:

Fig. 4.—NAPOLEON'S WATCH.

"1. The method of producing in a circuit electrical undulations similar in form to sound waves, by causing the sound waves to vary the pressure between electrodes in constant contact, so as to strengthen and weaken the contact and thereby increase and diminish the resistance of the circuit, substantially as described.

"2. An electric speaking telephone transmitter operated by sound waves and consisting of a plate sensitive to said sound waves, electrodes in constant contact with each other and forming part of a circuit which includes a battery or other source of electric energy and adapted to increase and decrease the resistance of the electric circuit by the variation in pressure between them, caused by the vibrational movement of said sensitive plate.

"3. The combination with the diaphragm and vibratory electrode of a rigidly held opposing electrode in constant contact with the vibratory electrode, substantially as described.

"4. In a telephonic transmitter, a vibrational plate made concave for condensing the sound, substantially as set forth.

"5. In a telephonic transmitter, a vibrational plate provided with one or more apertures, as and for the purposes set forth.

"6. A speaking telephone transmitter, comprising a diaphragm or disk sensitive to sound waves, combined with a rigidly held but adjustable electrode in contact with the same, whereby the electric current is transformed into a series of undulations corresponding with the vibrations of said diaphragm."

The apparatus described in this patent does not contain carbon or any form of carbon; it is simply a metallic contact between a diaphragm and a metal button, and its action as a transmitter is precisely what happened in the transmitter of Philip Reis when the adjusting screw of his notable instrument was in contact with the diaphragm. Those who are familiar with Reis' efforts remember that he was long anterior to Alexander Graham Bell in point of time, but that his efforts were held to be no bar against Bell's patent, for the reason that he only got occasional words transmitted when his apparatus happened to be in the proper condition of adjustment, and as he did not understand how to make the adjustment so that it could be of use for speech transmission, his apparatus was of no value as an anticipation. Berliner's patent was filed in the United States Patent Office June 4, 1877, and, so far as its functions are concerned, may be regarded as Reis' transmitter with the button screwed to the proper point of adjustment. This explanation gives point to the terms in Berliner's claims, "electrodes in constant contact." It will be noted that Berliner's method claim is limited to a variation of pressure between electrodes in constant contact. It is, therefore, an interesting query whether this alleged dragnet claim would cover a type of the Hunning's instrument, above referred to. But a very interesting question arises in the Berliner patent by reason of a decision of the Supreme Court of the United States in Miller *et al. vs.* Eagle Manufacturing Company, decided January 8 of this year, and which was referred to in the recent article in the *Electrical Review* above noted, which contains the following syllabus:

"The result of the authorities on this point of law is that no later patent can be issued for an invention actually covered by an earlier patent, especially to the same patentee, although the terms of the claims in the two patents may differ and the later patent may contain the broader claims, unless it distinctly appears that the invention covered by the later patent was a separate invention, distinctly different and independent from that covered by the first patent. It must contain something more than a mere distinction of the breadth or scope of the claims."

Now, inasmuch as Berliner patented a telephone November 2, 1880, No. 233,969, showing and describing exactly the same apparatus as is shown and described in the above quoted patent, but in which a claim both for the apparatus as a receiver and for the system of transmission were claimed, it would seem that the later patent would be void.

There is another interesting patent which those entering this field should consider, and that is a patent of Berliner bearing upon the use of an induction coil for raising the tension of line current. The original patent is dated January 15, 1888, No. 199,141, and contains five claims limiting the invention to a receiver located in a circuit containing a galvanic battery which is acted upon inductively by the line. This patent was reissued December 14, 1880, and the following broad claim was introduced:

"A telephone transmitter which operates to vary the resistance of the circuit in which it is placed without interrupting it, in combination with a local battery, a short primary circuit of an inductorium which includes both, and a secondary circuit of said inductorium proceeding toward the distant station."

Inasmuch as this patent will not expire until next January, it stands glowering upon the unhappy infringer. Whether, in view of the fact that the reissue was not filed until almost two years had expired, during which the telephone art had made great progress, this reissue claim would be sustained is open to question. The law in regard to reissues has grown very strict in late years, and where they have been taken for the purpose of expanding the claims after the progress of the art had pointed out the value of the expanded claims, they have been held void.

It will thus be seen that, so far as the use of the transmitter is concerned, the chances are strongly with the public and with the infringer, though he may be put to the very serious inconvenience of a protracted legal controversy with the American Bell Telephone Company.

Those who contemplate the use of a number of lines radiating to a central point, where operators can be employed to shift the connections so as to connect together different subscribers, will have another serious problem to confront. There are a great number of switchboard patents covering the various details of a central station which must of necessity be carefully avoided. These inventions are exceedingly complicated, by reason of the number of connections to be made, and cannot be considered here. One who expects to accomplish what is now done in the telephone central station without colliding with some of these patents will assume a burdensome task. There are some things, however, that may be taken for granted, and that is there were switchboards for connecting any of the various lines entering a common office in use long before the days of telephony. The types of switchboards used in telegraphic service could probably be improved so as to yield fairly good results, which would perhaps enable a small central station to be conducted; but in this respect we can only caution the inventor to bear in mind that he will have a large number of patents to consider before he can feel at all satisfied that he is not treading upon the toes of some one who was earlier in the field.—*Electrical Review.*

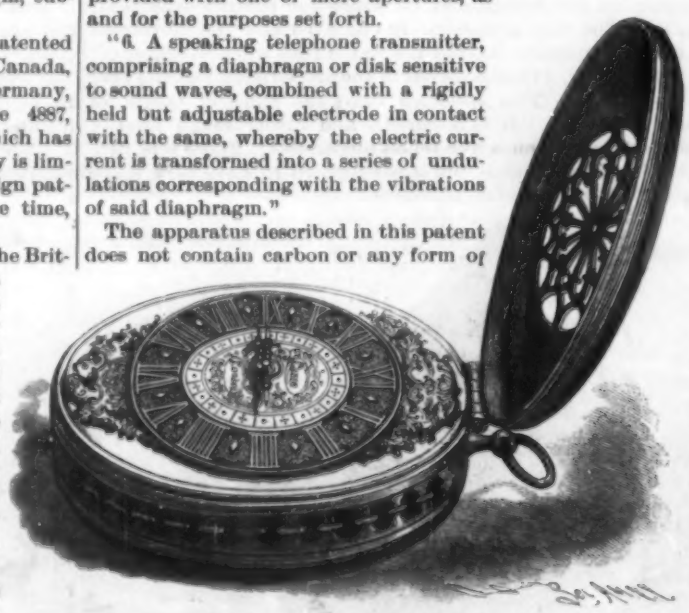


Fig. 2.—OPEN WORK STRIKING WATCH, MADE ABOUT 1600 BY QUARE.

SCIENTISTS are of the opinion that some icebergs last for two hundred years.

Remarkable Applications of Electricity.

Although modern scientific investigators have devoted much attention to electricity, we are probably as far as ever from knowing what this mysterious power really is. All that has been obtained is a fairly complete knowledge of its ways of working, and with this knowledge has come a rapid extension of its industrial applications, since it has been found to be a natural force which is pre-eminently adaptable and easily controlled. Great improvements may confidently be looked for in the near future, especially in the cheapness of its production, and there is the possibility of discoveries which may appear to us as wonderful as the telegraph and telephone when these were first introduced. Even now, when electrical engineering may be said to be but in its infancy, electricity is being used in a great variety of minor ways, besides its more prominent uses in telegraphy, telephony, and public and private lighting. As a motor power it is rapidly taking the place of steam for putting in motion machinery of all kinds, though as yet steam power has to be used, in the first instance, for its production.

It would be impossible, within moderate bounds, to enumerate all the different purposes for which electricity is actually being used, or for which it has experimentally been found suitable, though not yet put into actual use, and only some of its more interesting applications are here referred to.

The use of electricity for household purposes has hardly got beyond the experimental stage, save in the department of lighting; but enough has been done to show what a transformation may be worked by its aid when it will be possible to have houses heated by it. Then the mere turning of a switch will suffice; and the current, passing through a suitable heater, which may be as ornamental as means and taste permit, or, if desired, entirely concealed, will do the rest, superseding fires, with all their attendant trouble, smoke, and dust. With regard to cooking, there are numerous appliances already devised, and only waiting for the cheapening of the current to be widely taken advantage of. Each cooking utensil, being constructed with the heating coil as part of it, is its own stove; and the whole array of pots and pans need only to have the connection made, and the cooking can go on under the most perfect control. Some of the possible arrangements even appear to put a premium on laziness, for, with the food put in the cooking utensils at night, and the necessary connections made, the turning of a switch in the morning in the bedroom starts the cooking of the breakfast.

A New York lady is said to have so contrived matters that she can, before getting out of bed, start a fire in the kitchen by turning on the current; and when she comes downstairs finds the kettle boiling and the place comfortably warmed.

The heating powers of the electric current are also turned to account for raising to the desired temperature hand stamps, curling irons, branding irons, and the like; while in large laundries electrically heated irons have been found very economical, as they maintain for hours at a time the exact amount of heat suitable for the work, thus saving the ironers much time and trouble.

The electric light lends itself admirably to household decoration. Among other curious displays is a table decoration in which jelly is illuminated by a light, shining through the mass from the center; and when the dish, at first hidden by a silver cover and a mass of flowers, is suddenly uncovered, the effect is very striking. Edison is said on one occasion to have had on the table an aquarium in which were gold fish, each of which had in some way been made to swallow a tiny electric lamp connected with a dynamo by a hair-like wire passing out of its mouth. When the current was turned on, the fish presented a strange appearance, their delicate bodies showing all the minute details of their anatomy. The use of very small secondary batteries provides means for startling effects in personal decoration, by lighting up jewels and flowers, as has been largely done on the stage; and even walking-sticks have been furnished with small incandescent lamps.

Medical science has called electricity to its assistance in many ways. Various surgical instruments are heated by it; and the use of very small incandescent lamps, which give out practically no heat, permits more extended examination of internal parts than is possible in any other way. The use of the microphone has revealed sounds in the heart, lungs, and other organs which have hitherto escaped the most sensitive ear using the ordinary instruments. In Russia a lady was saved from premature burial by means of a microphone placed over her heart, which enabled a medical man to detect a faint beat, which had escaped the ordinary tests.

Though recent experiments have demonstrated the absurdity of much that passes for medical use of magnetism, electricity has been employed as a curative agent in various ways. One of the most curious is the electric light bath. The virtues of sunlight are well known, and there is supposed to be sufficient similarity between the light of the sun and the electric light to make the electric light bath serve as a readily available substitute for the sun bath. A closet of sufficient size to accommodate a person, constructed of polished nickel to give a good reflecting surface, is fitted up with a number of sixteen candle incandescent lamps, so arranged as to take up the least possible room and afford the largest possible radiating surface, while the temperature can be regulated by passing the current through a resistance coil. As the temperature in the inclosure can be raised in ten minutes to a hundred and fifty degrees Fahrenheit, the result is equivalent to a combined light and vapor bath. The skin is browned as if by sunburning, and the effect is claimed to be most salutary.

Another recent development is the use of electricity as a local anæsthetic. Painless operations have been conducted under its influence, and similar applications with suitable apparatus have induced cessation of pain in acute tic douloureux. Remarkable cures have also been obtained in such painful maladies as lumbago and rheumatism by simply pressing a small, specially shaped incandescent lamp on the skin over the seat of the pain.

It has been found that sufferers from "shaking paralysis" are much better after a rough railway journey; and the late Dr. Charcot, of the Salpetriere, Paris, the famous specialist in nervous diseases, applied this principle in the construction of a bed to which a rapid vibratory movement is given by means of electricity; and this shaking, which to a person in good health would be intolerable, proves quite enjoyable to the paralytic subject, who appears to be refreshed by it. Another French physician has devised a vibrating helmet for the cure of nervous headache. It is constructed of strips of steel, put in vibration by a small electromotor, which makes six hundred turns a minute. The sensation, which is not unpleasant, produces drowsiness; the patient falls asleep under its influence, and awakes free from pain. An American inventor has brought out a rocking chair actuated by electricity, and the sitter can at the same time receive gentle currents by grasping metal handles or by resting the bare feet on metal pedals.

Remarkable results have been obtained from experiments regarding the influence of electricity on the growth of plants. Professor Spechneff, at Kiev, by an arrangement of poles connected by wires, condensed atmospheric electricity over the inclosed area; and the ordinary grain crops grown within the inclosure showed an increase of from twenty-eight to fifty-six per cent in the weight of the yield of grain, and from sixteen to sixty per cent in the weight of the straw. Potatoes showed an increase of only eleven per cent, but they were from a parasite which devoured the unelectrified crop. By exposing plants at night to the electric light, thus supplementing sunlight, assimilation and growth became continuous, with consequent great increase in the produce; but it has to be noted that, as in plants under normal conditions, assimilation and growth alternate at different periods of the day, the great development of tissues under the double influence cannot be entirely beneficial. Professor Spechneff also tried the effect of electrifying seeds before planting, and found that when they were subjected to the current for only two minutes the rapidity of their growth was nearly doubled. Electrifying the earth in which vegetables were grown had also a prodigious effect, the harvest of roots being four times superior to the ordinary, and that of the leaves, etc., two or three times.

In France the De Meritens system of treating wines by passing currents of electricity through them has been officially tested and reported on favorably. This treatment is found to mellow and preserve healthy wines, and to arrest deterioration in those beginning to give way. Alcohol has also been experimented with, showing a considerable hastening of the maturing processes, the objectionable fusel oils, which render new spirits almost undrinkable, being rapidly converted into complete alcohols. Another industrial purpose to which electricity has been applied of late is tanning, in which it much shortens the time required in the ordinary way. Some measure of success has also attended experiments in purifying sewage by its use.

The well known attraction which light has for fish has induced ingenious fishermen to utilize the electric light as a bait, and it is said that this never fails to bring together large shoals of fish, which swim round the illuminated globe, and are easily caught.

The ingenious Yankee is never behindhand in odd adaptations, and a patent has been taken out in the States for a mechanical pickpocket and coat thief detector—an electrical apparatus which automatically rings an alarm bell when the bearer's personal property is tampered with. Another inventive genius so combined electricity and photography as to secure a flash-light photograph of thieves at work in his office. When they opened a glass case they completed an electric circuit which exposed the camera, and simultaneously kindled the flash-light, to the great alarm of the depredators.

There was recently exhibited to the Royal Society an automatic harbor watchman, named the "hydrophore," which is so constructed that when a torpedo boat approaches within half a mile, or a man-of-war within a mile, the vibrations of the screw propeller are detected and transmitted to the signaling station.

Electricity has further been used in the industrial processes of engraving, bleaching, dyeing, the reduction of ores, and the purification of metals. Mainly by its aid, aluminum can now be produced at a price which is no longer prohibitive. Prior to 1855 it sold at three hundred and sixty shillings per pound; by 1862, it had fallen to twenty shillings per pound, while now it costs only a shilling or two. The cheapest chemical methods of producing it cannot compare with the electrical. By the use of electricity for welding what is in effect a new power has been put into the hands of mechanicians and constructors. It was formerly considered that only iron, steel, and platinum could be firmly welded, while now nearly every known metal and alloy has been successfully welded by the help of electricity.

An electric ventilator has been devised for supplying buildings with fresh air, cold or warm, as may be desired. An electric motor sets the ventilator revolving, and the revolution sucks cool air in. When warm air is desired, a current of electricity is sent into a network of fine wire, through which the air must pass, heating the wires, and these impart their heat to the air.

For the detection of underground ores an "electrical finder" has been devised. The mechanism of this instrument includes a telephone, which is silent in the absence of metal or magnetic ore; but if such be present, induced currents arise, which produce sounds in the telephone which are recognizable by experts.

What should prove a most useful industrial development is the application of electricity to the cleansing and preservation of boilers. The method employed is the sending of currents periodically through the shell of the boiler. By this means the scale formed on the shell and tubes is disintegrated and easily removed.—*Chambers's Journal.*

Coloring Gelatino-bromide Prints.

The *Archiv* gives the following plan for getting different colors on bromide prints. The prints are feebly developed with eikonogen, fixed, washed, and then immersed in a solution of:

Nitrate of lead	4 parts.
Red prussiate	6 "
Water	100 "

This bleaches the image, which may then be colored thus:

Brown.

Schlippe's salt	10 parts.
Ammonia	5 "
Water	150 "

Yellow.

Neutral chromate of potash	4 parts.
Water	100 "

Green.

Immerse the yellow prints in:

Iron perchloride	1 part.
Water	10 parts.

Red.

Immerse the yellow prints in:

Chloride of copper	1 part.
Water	10 parts.

Nickel Green.

Chloride of nickel	1 part.
Water	10 parts.

Orange.

Mercury bichloride	3 parts.
Potassium iodide	4·5 "
Water	100 "

Aluminum Boats and Sleds.

Mr. Wellman's American polar expedition, which is now about to leave Norway for the Arctic seas, makes, according to *Industries*, a new departure in Arctic voyages. Both the boats and sleighs with which the party is equipped are constructed of aluminum, and thereby considerably reduces the weight which the exploring parties will have to carry. The boats are three in number, and are built on the lines of the surf-boats of the United States Life Saving Service. They are of about the same capacity as those used by Sir E. Parry in the 1827 expedition, but, instead of weighing 1,700 pounds, only weigh some 350 to 400 pounds apiece. The aluminum used has a tensile strength of 54,000 pounds per square inch, and the sides of the boats are so hard that it is impossible to puncture them with repeated blows of the hammer. The sleighs are also made of aluminum, and consist of sheets of well-tempered metal, weighing about 26 pounds each, with a carrying capacity of 1,000 pounds. Each sleigh, in addition, is fitted with a watertight case of the same metal, weighing an additional 40 pounds, which has a sufficient displacement to carry the sleigh and its entire load, so that they can run through slush, or be used as boats in open water without damage to the stores.

Another novelty is the use of saccharine in the place of sugar as a sweetening substance. Although a few ounces of saccharine may be the equivalent of two and a half barrels of sugar, so far as sweetening power is concerned, it is certainly not its equivalent as a food stuff.

RECENTLY PATENTED INVENTIONS.

Engineering.

STEAM GENERATOR.—Alexis F. Gillet, Kearney, Neb. This generator comprises a fire box on which is supported a shell in which is arranged a coil of pipe connected with a water supply, a steam generating block being connected with the discharge end of the coil and having a continuous water channel at the end of which is a steam chamber, there being a check valve in the discharge end of the coil of pipe, and a second check valve in its inlet, with a water pressure regulating valve in front of the latter. The arrangement is such that steam is generated in just the proportion that water is forced or supplied to the block, the volume and pressure of steam being governed by regulating the water supply, and the construction being very safe, simple, and economical.

BRIDGE GATE.—Benjamin Moore, Chicago, Ill. This inventor has designed a simple mechanism for use in connection with any swing bridge, to automatically close the approaches when the bridge is swung out of alignment, and automatically open the gates when the bridge is brought into normal position. The improvement operates without regard to the direction in which the bridge is turned, and the construction is simple, inexpensive, and not likely to get out of order. The gates are operated by the depressing of cranks depressed by the action of the bridge, a crank shaft being journaled, and the crank carrying a roller extending into the path of an inclined block secured to the under side of the bridge.

GAS HOLDER AND PURIFIER.—Donald McDonald, Louisville, Ky. The water seal tank or reservoir of this improvement has within it a supporting framework carrying at its upper side a stationary floor above the water level, and a vertically adjustable and balanced receiver is made in two sections detachably connected, the upper section being above the floor at all times and having side doors, while purifying boxes or trays are arranged upon the floor and adapted to be reached by wheelbarrows wheeled across the floor. The improvement is especially designed for fuel gas works, providing a very large generating capacity, and a purifying device which will treat a large volume of gas as fast as made.

Railway Appliances.

CAR FENDER.—William V. McManus, Baltimore, Md. This improvement comprises a guide frame and a receiving frame having a sliding connection at its lower front edge with the guide frame, the sliding connection including an inclined bearing whereby the front edge of the receiving frame is depressed as it is pushed rearwardly. The operation of the fender is entirely automatic, requiring no attention on the part of the motorman or gripman, the fender, as it is pushed rearward by contact with an obstruction, being depressed or moved down close to the track and adapted to efficiently cushion the fall of a person upon it.

ELECTRIC RAILWAY SYSTEM.—Charles D. Tisdale, Boston, Mass. This improvement provides for taking the current from the railway track rails or from conducting rails carried along with and parallel to the track. The truck motor has two paper car wheels and two iron or steel wheels, the paper wheels being on opposite ends of different axles and the metallic wheels arranged diagonally opposite each other, so that electrical contact is made with one of the railway rails through one of the metallic wheels, and with the other rail by the other metallic wheel. The device is designed to furnish the current to the motor and return it to the power station without the necessity of charging a great length of track or conducting rail.

Mechanical.

NUT LOCK.—Joseph Burrows, Globe, Arizona Ter. This is an improvement on a former patented invention of the same inventor, in which the nut of the bolt had recesses in its face adapted to receive keys or wedges of novel construction. The invention provides improved forms of recesses and keys, and better promotes facility of operation in locking and unlocking the nut.

FINISHING JOINT IN WOODEN WALLS OR CEILINGS.—George Knower, Greenwood, Wis. This is a cheap, simple and flexible batten, which may be made of paper and conveniently applied, folding up tightly when the joints are new and tight, and expanding with the shrinkage of the adjacent wood, keeping the joint tightly closed and absolutely air tight, without regard to the shrinkage.

OIL CLOTH PRINTING MACHINE.—William H. Schoenberg, Philadelphia, Pa. This is a machine for printing from long webs or strips, no hand work being necessary to effect the printing, the printing block being moved regularly up and down, and the color automatically applied as the web of material is continuously fed forward. The color boxes and printing blocks are arranged one after the other in series, their number corresponding with the number of colors usually printed, a box and its block being adapted to use one color only.

MEASURING INSTRUMENT.—Leonard M. Hodge, San Jose, Cal. This instrument is more especially designed for the use of carpenters and other mechanics, to readily obtain bevels for rafters and for similar purposes. It consists of a right angle triangle provided with two pivoted arms indicating on opposite sides of a graduated segment forming an integral part of the triangle.

WORKING BARREL PROTECTOR IN WELL MAKING.—Charles R. Lasher, William J. Webster, and David L. Newton, of near Oakdale Station, Pa. This improvement is designed to prevent the loss of the working barrel in pumping wells, enabling the operator to quickly and conveniently draw up the casing containing the barrel, should the latter become disconnected from the tubing. The invention consists of an integral casing having a cap for the passage of the tubing, and an abutment inside of the casing, and carried by the tubing or the barrel, to engage the inside of the cap.

Agricultural.

BAND CUTTER AND FEEDER FOR THRASHING MACHINES.—George D. Lamm and William Sicard, Ackley, Iowa. This improvement is adapted for connection with the ordinary thrashing machine frames, the cutting and feeding mechanism having a conveyer frame formed in sections adapted to be folded up and under the front end of the thrasher frame proper in compact form, to facilitate carriage from place to place. The cutting blades are also arranged so as to have one or more of them passing through the sheaves at all times during the operation of the machine, there being also suitable shields or protectors for the blades, to prevent injury thereto and the grain from being carried over the cutter shaft.

COTTON SEED CLEANER AND SEPARATOR.—James W. Smith, Rome, Ga. The seed-receiving chamber of this machine has as its mouth the discharge end of the hopper, into which is projected a blastway connected with a blower, the blastway having its upper wall formed of a member hinged at its upper end to the hopper, while adjusting devices are connected to the free end of the hinged member, whereby its lower end can be set to adjust the lower opening of such blastway. The machine effectively cleans the seed and separates therefrom gravel, iron ore, nails, etc., the force of the blast being readily regulated.

FEED MILL.—John O. Smith, Nashville, Tenn. This is an improvement in mills for grinding corn, corn cobs, oil cake, and similar hard and tough food products, the mill being very strong and inexpensive, and so made that it can be operated with comparatively little power. The revolving knives are so arranged that they may be reversed or renewed when necessary.

RATTLE RAKE.—Richard Keeling, Walhalla, North Dakota. The construction of this rake is such as to afford a much larger surface for the exit of grain upon the lower stretch of the rake than at the upper surface or top stretch, thus permitting the material falling upon the rake to quickly leave it, and preventing the straw from winding around the rollers or drums carrying the rake.

Miscellaneous.

BICYCLE.—Thomas B. Hyde, Taylor, Texas. The driving mechanism of this machine is adapted to be operated by the hands or the feet of the rider or by both, the motion of the rider being similar to that of rowing. The propelling mechanism is so constructed and the rider's seat so located that he must assume a position on the machine corresponding to that taken by an oarsman in a boat, and is thus able to exert great energy and strength, while the seat can be rendered extremely comfortable.

LINE CHALKING APPARATUS.—Carl E. Anderson, Wood's Holl, Mass. This improvement comprises a two-compartment box, one compartment being V-shaped at the bottom and adapted to receive the chalk, while in the other compartment is a spool or reel carrying the line. The line passes from the reel over guide rollers, passing around a roller in the bottom of the chalk chamber, and has a ring on its outer end outside the box. The roller in the chalk chamber is removable, adapting the device for use where the chalking of the line is not necessary. The box or casing has a hinged cover with suitable handle and fastening, and the device is a great convenience for holding and keeping in a cleanly and compact way the chalk line used by carpenters, gardeners, and other artisans, and automatically chalking the line.

DRYING KILN.—Adolphus Kimball and Phineas Kimball, Arkansas City, Ark. This kiln is an air-proof building, having at its green end a steaming room for softening the lumber by steam previous to drying it in the air chamber adjacent. Through the building run tracks to receive the lumber trucks and hold the lumber in inclined position, each pile of lumber on a set of trucks, and the sets of connected lumber trucks being moved along by an endless chain. The heated air passing through the lumber is received in a box with which is connected an exhaust fan or blower.

ENAMELING PAPER, ETC.—William H. H. Childs, New York City. A method of manufacturing imitation pebbled leather and other fabrics has been patented by this inventor, by applying heated pitch or similar material to paper or other fabric, then subjecting the fabric to heat. The invention provides for effecting the pebbling simultaneously with forming the enamel, and thus making a substitute for leather in the manufacture of pocket books, book covers, etc.

POSTAGE STAMP ATTACHING MACHINE.—Oscar J. Moe, New York City. Combined with a water tank and endless moistening belt is a reciprocating plunger and feeding mechanism for causing the stamps to pass downward past the plunger, when an envelope is passed down in proper position in a slot in the machine, there being operating connections between the plunger, the belt and the feeding mechanism.

DRUGGIST'S WEIGHING SCALE.—Edward Kelly, Lebanon, Ky. This inventor has devised a prescription scale, with which the apothecary may weigh the various denominations of both the metric and apothecaries' systems of weights, with one weighing poise and one series of markings on the weighing arm of the scale beam. And with this scale the equivalent in the United States apothecaries' system of any denomination of weight of the metric system, or vice versa, may be readily ascertained without calculation.

WASHING MACHINE.—Louise Kelly, Rossbank, N. Y. This is an improvement in that class of washboard attachments consisting of a sliding rubbing board arranged to work on rods held parallel to the rubbing surface of the washboard. The device is very simple and inexpensive, and may be attached to any board in a convenient manner.

COVER FOR FRYING PANS.—Mary E. Radick, White Plains, N. Y. This cover for frying pans, griddirons, etc., has a pendent flange, which is upwardly and inwardly curved at its lower edge, forming a groove or channel for the reception of any substance which may run from the inner face of the cover, so that when the cover is removed from the vessel all drip will be prevented.

BERRY CRATE.—Peter A. and Robert S. Wimbrow and Harry P. Dale, of Whaleyville, Md. This crate is made of horizontal rails or bottom strips, vertical and parallel side or slat strips, and horizontal top strips, the vertical side strips being made of veneer and being quite thin and flexible. The construction is such that a strong and light crate is made at a moderate cost, and one which will hold the berry baskets without injuring the berries.

NECKTIE.—Gustave Selowsky, New York City. This tie is so made that money and other valuables may be conveniently and securely carried in it. The improvement may be applied to "Tecks," "four-in-hands," "puffs," and other forms of scarfs, and comprises a pocket in the lower portion of one apron or end, the pocket being closed with a flap. The appearance of the tie is not injured, and the weight of the contents of the pocket tends to hold the scarf or tie down, so that no fastening is needed for this purpose.

CHALK SHARPENER.—George Hay, Pictou, Canada. To smoothly sharpen chalk for cloth cutters' use, and remove the cuttings or dust, this inventor has designed a simple and efficient device, in which a closed receptacle receives the shavings, the receptacle being adapted for use as a paper weight. The bottom wall of the base piece is heavy, rendering the chalk cutters stable, so that one does not have to hold the device in place when the chalk needs to be redressed on the edges.

SLIDING GATE.—William Woods, Frostburg, Md. This inventor has devised an improvement in that class of farm gates which are hung and adapted to run on elevated ways or tracks, the invention embodying a simple and easily operated arrangement of a fixed and a tilting track. The latter track is raised or lowered by pulling on cords, the gate being thus opened or closed with great ease and rapidity. The pull cords are easily accessible from a carriage on the roadway or by one on horseback.

SIGN PRINTER.—William E. Rose, New Carlisle, Ind. This device consists of a wheel having a handle and adapted to carry type or segmental printing blocks, with adjustable guide and stop devices. It is adapted for printing signs with paint upon fences, sidewalks, bridges, or any rough surface, or for printing any desired matter upon boxes, show cards, etc., the type surface of the wheel being rolled over a surface to which moist paint has been applied before applying the wheel to a surface to be printed.

SETTEE ARM.—William C. Bartol, Lewisburg, Pa. This improvement is especially adapted for use in connection with settees in colleges, schools or lecture rooms, the arm being so made that it can be readily attached to any settee. The arm may also have an adjustable table or paper support, enabling students to conveniently take notes of lectures, the table being turned to a vertical position to permit convenient access to or egress from the seats.

ROPE CLAMP FOR PULLEY LINES.—Thomas Bevan, New York City. This clamp may be easily applied, and one end of the rope may be loosened from the clamp and the slack taken up without danger to the operator, since the loosened end of the line is always in the direction of the apartment. A guide is also combined with the clamp to prevent the under stretch of the line from sagging from or leaving the upper stretch for too great a distance.

DISPLAY RACK.—Sylvester P. Denison, Belleville, N. J. This is a device which can be very cheaply manufactured, while its construction is durable, and it can be readily extended or folded so as to take up but little space. It is especially designed for use in stores and other places to support and conveniently display articles of merchandise, such as hats, hosiery, neckties, etc.

BUCKLE.—Arthur Morris, Rockefeller, Ill. This buckle is more especially designed for use with harness for farm horses, particularly for attaching the breeching to the other portions of the harness in such manner that the breeching may be readily removed when occasion may demand. The buckle may be removed with the breeching without removing the trace or trace loop, and it will also take the place of the ring strap, sheath and buckle common to farm harness, thus lessening the work of harnessing.

Designs.

FORK SCRAPER.—William J. Osterman, Richmond, Va. The scraper blade of this design is notched or serrated, to form teeth which enter between the prongs of the fork, against which the scraper is held by a shank rod attached by loops forming a spring tension to the handle of the fork.

BROODER.—Earl Barney, Schenectady, N. Y. The leading point of this design is in the novel conformation of the exterior of the brooder, the roof being composed of three panels or members of varying degrees of pitch.

HAMMER.—Zephiren Duchemin, Haverhill, Mass. The head of this hammer has two faces, one flat and round and the other convexed and oval, the faces being at an angle to each other and extending at all sides beyond the lines of the shank or cross bar that joins them.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

NEW BOOKS AND PUBLICATIONS.

ECONOMIC GEOLOGY OF THE UNITED STATES, WITH BRIEFER MENTION OF FOREIGN MINERAL PRODUCTS. By Ralph S. Tarr. New York and London: Macmillan & Co. 1894. Pp. xx, 509. Price $4.

Professor Tarr is known to many of our readers from his contributions to the publications of the SCIENTIFIC AMERICAN. He possesses admirably the art of putting in popular shape the most advanced views of his science. The economic geology of the United States is a field well covered by the book, which not only treats of ores and fuels, but also of building stones, cements, precious stones, mineral waters and allied topics. One thing about it which may be termed a genuine feature is a most exhaustive index of nearly 40 pages, an example which it may be well for other authors to follow. A short appendix on the literature of the science is of interest also.

THERMODYNAMICS OF REVERSIBLE CYCLES IN GASES AND SATURATED VAPORS. By M. I. Pupin. Arranged and edited by Max Osterberg. New York: John Wiley & Sons. 1894. Pp. v, 114. Price $1.25.

This work is a synopsis of a ten weeks' undergraduates' course of lectures delivered before the engineering students of Columbia College by Dr. Pupin. Mr. Osterberg has put his notes of those lectures into shape, and in this book we find them published with the approval of the lecturer. The subject and its treatment combine in imparting to the book a character of special value and timeliness.

THE "PRACTICAL ENGINEER" POCKET BOOK AND DIARY. Edited by W. H. Fowler. Manchester: Technical Publishing Company, Limited. 1894. Pp. 293. Price 60 cents.

This very attractive little work contains over 200 pages devoted to general engineering topics followed by a diary for the year, with memorandum pages following the diary pages. It is one of the annual publications which have a very well recognized place in engineering literature and will be well received, we do not doubt, by the profession.

EXPERIMENTE MIT STROMEN HOHER WECHSELZAHL UND FREQUENZ. Zusammengestellt von Etienne de Fodor. Revidirt und mit Anmerkungen versehen von Nikola Tesla. Mit 94 Abbildungen. Wien, Pesth, Leipzig: A. Hartleben's Verlag. 1894. Pp. xvi, 291. Price $1.

Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion: about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in the following week's issue.

"T. S." metal polish. Indianapolis. Samples free.

For mud dredging engines. J. S. Mundy, Newark, N. J.

Microbe Killer Water Filter, McConnell Filter Co., Buffalo, N. Y.

Agricultural patent for sale.—P. J. Ebersohl, Centerville Station, Ill.

Cheapest Water Power.—See top of 1st column, page 170. Also top of 2d column, page 220.

Bookbinding.—All classes of work. Magazines a specialty. Haddon & Co., 139 Center St., New York.

Steam Hammers, Improved Hydraulic Jacks, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Screw machines, milling machines, and drill presses. The Garvin Mach. Co., Laight and Canal Sts., New York.

Centrifugal Pumps. Capacity, 100 to 40,000 gals. per minute. All sizes in stock. Irvin Van Wie, Syracuse, N.Y.

Emerson, Smith & Co., Ltd., Beaver Falls, Pa., will send Sawyer's Hand Book on Circulars and Band Saws free to any address.

Guild & Garrison, Brooklyn, N. Y., manufacture steam pumps, vacuum pumps, vacuum apparatus, air pumps, acid blowers, filter press pumps, etc.

Patent for Sale—Stall for comfort and cleanliness of milk cattle. Agents wanted at 50 per cent commission. M. Schembri, 206 Van Buren St., St. Paul, Minn.

The best book for electricians and beginners in electricity is "Experimental Science," by Geo. M. Hopkins. By mail, $4; Munn & Co., publishers, 361 Broadway, N. Y.

For the original Bogardus Universal Eccentric Mill, Foot and Power Presses, Drills, Shears, etc., address J. S. & G. F. Simpson, 24 to 36 Rodney St., Brooklyn, N. Y.

Patent Electric Vise. What is claimed, is time saving. No turning of handle to bring jaws to the work, simply one sliding movement. Capital Mach. Tool Co., Auburn, N. Y.

Competent persons who desire agencies for a new popular book of ready sale, with handsome profit, may apply to Munn & Co., Scientific American office, 361 Broadway, New York.

☞ Send for new and complete catalogue of Scientific and other Books for sale by Munn & Co., 361 Broadway New York. Free on application.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(5974) J. E. E. asks: 1. Could storage battery plates be made porous by making them of lead and zinc melted together and afterward eating the zinc out with acid? A. It is doubtful. If you could get an alloy with a preponderance of zinc stable on cooling it might be done. 2. With what number and amount of wire should I wind a bell to ring over 75 rods of No. 12 galvanized iron wire with earth return? And how many cells gravity will it require? A. Use 4 cells gravity battery and wind bell to about 6 ohms resistance, say 4 ounces No. 24 wire.

(5975) I. A. H. asks: Is the electric spark the passage of a mass of electrified matter, or a current through rarefied air similar to a Geissler's tube? If neither, what is it? Is the arc of the arc lamp a similar phenomenon? Is there any work which systematically treats this and allied subjects? A. The electric spark is attributable to the heating of the air, and to the transferal of heated material of the electrodes. The voltaic arc proper is due largely to incandescent carbon vapor. Such subjects as these are treated in different works. No work can well be named which is restricted to such topics.

(5976) H. E. says: Kindly give me a recipe for destroying moths and worms, such as infest upholstered furniture and ruin carpets.

A. Alcohol ..... 500 parts.
Naphthaline ..... 10 "
Carbolic acid ..... 10 "
Camphor ..... 5 "
Essence lemon ..... 5 "
Oils of thyme, lavender and savine (of each) ..... 2 "

This can be used by sprinkling over furs, clothes, carpets, furniture, etc., or, better still, by application by a spray producer.

(5977) P. M. asks (1) if the current from an induction coil would be of any use if it was constant. A. Yes; it might be desirable for some work. 2. Is the current from an induction coil the same as that of an alternating current dynamo? A. It is the same in general, but the form of the wave curve may be quite different. 3. Why cannot an alternating current be used to ring an ordinary bell? A. The alternations are too rapid.

(5978) T. R. E. writes: 1. I have a piece of pyrites I overheated trying to solder a scarf pin to it. Is there any way to get it back to its bright color again? A. You cannot restore the color and luster. Use cement for pyrites, you cannot solder it. 2. How can I drill a hole through it? A. For drilling, use a diamond drill. 3. Suppose a box car is running 20 miles an hour, doors shut tight. A man jumps on the floor with and against the motion; can he jump one way further than the other? A. The person jumping in a car can jump no further one way than another. 4. I have an incandescent 3 candle power lamp. Both wires got blown off close to the glass before using. Can I do anything with it? A. You can only connect with your lamp by arranging to press the ends of your conductors against the ends of the wire.

(5979) E. W. M. asks: 1. Is there any serious difficulty in charging a storage battery of 30 cells, arranged in three parallel series of ten each, and discharging them all in series, provided all the cells are as nearly alike as possible and the several series as nearly as possible of the same resistance? A. There is a difficulty. It is advisable to charge them in three series, one series at a time, if you cannot charge the whole number in series at once. 2. Will not tin plate answer well for the disks of a dynamo armature? Will they be better for removing the tin? A. Yes. They would be better without the tin. 3. If an alternating current at constantly varying E.M.F. be passed through a converter, will the E.M.F. on the secondary circuit be constant or will it vary in proportion to the primary? A. The secondary current will vary with the intensity of the primary current, and, the currents depending on the E.M.F., the potentials will also vary. 4. In what way are low voltage Edison lamps uneconomical, do they require more current or do they burn out quicker? A. They are not uneconomical except as requiring larger conductors for a given candle power.

(5980) W. A. S. asks how to stain a gun barrel. A. Clean the barrel thoroughly, then sponge with the following solution which is made up by weight: Antimony protochloride, 4 parts; sulphuric acid, 2 parts; empyreumatic pyroligneous acid or gallic acid, 1 part. Apply several coats until the barrel is dark enough.

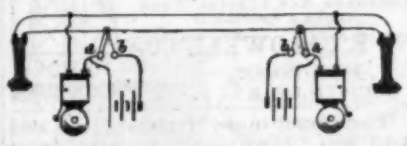
(5981) C. W. T. says: We have a number of small water motors here, and I desire to get at the amount of water used by them. What is the volume of discharge in cubic feet or gallons, due to 50 pounds pressure, or a head of 118 feet, from respectively 1-16 inch, ⅛ inch and ¼ inch nozzles, of the kind usual in small motors? A. The 1-16 inch nozzle will discharge 0·1073 cubic foot or 0·7777 gallon per minute. The ⅛ inch 0·443 cubic foot, or 3·322 gallons. The ¼ inch 1·772 cubic feet, or 13·29 gallons.

(5982) F. M. B. asks how to make a cheap single coil electric sounder and the materials needed. A. Make a core of bits of iron wire each 2 inches long, the bundle being ¼ inch thick. Glue paper around it and wind with four or five layers No. 20 wire. As armature use an iron nut soldered to the end of a spring. Bend the lower half inch of the spring at a right angle and screw to base board. Mount the magnet horizontally on a block screwed to the board.

(5983) A. M. R., Toronto, asks for the best method of dealing with water supply pipes to prevent condensation of moisture in passing through warm apartments, or secondly (if it cannot be prevented) the best plan to protect wall or ceiling from the dripping of the water. A. Thorough felting of the pipes, the same as with steam pipes, will prevent dripping of water.

(5984) J. K. asks: If the balance wheel on machinery run by an electric motor was changed from the main shaft as now run, making 40 revolutions per minute, to the intermediate, making 120 revolutions per minute, what would be the gain in power to overcome loads suddenly thrown on the main line, as compared to the present arrangement? A. It would have nine times the energy.

(5985) F. H. W. asks if there is any way that two hand telephones (receivers) can be connected by two wires only, and no ground, between two stations, and to signal with a two-point switch at each station, without using a push button with the battery and bell call; there are to be a set of batteries and bell at each station. What I want to accomplish is to have or give the signal to the distant station by simply moving the switch over and back. As the line is not very long (about 100 feet), I do not care to use a magneto, and if it can be done by only two wires, and no ground, with a two-point switch, I should like to know the way; otherwise I will use three wires, as there is no good means to make a ground connection. A. The annexed cut will give you an idea of the method of connecting up the required circuit. The normal position of the switch would be on the



point, *a*, connected with the bell. When it is desired to call, the switch arm is moved over to the contact, *b*; after the call is answered, the switch arm at either end of the telephone line is thrown off from the point, *b*, and left open. As soon as the conversation is finished, the arms are returned to the point, *a*.

(5986) C. W. H. asks (1) whether a magneto telephone will work on the same line with an electric telephone? A. Yes. 2. Also please give a diagram of a magneto telephone on a line 1,000 feet long with common electric bells for calls. Please give the diagram with the smallest number of line wires possible. A. See reply to query above.

(5987) J. S. M. asks: 1. On a common slide valve engine, cylinder 12×18 inch, how large ought the steam and exhaust pipe be? Is it best to have the exhaust pipe larger than the steam pipe? If so, how much larger? A. The speed of the engine is also an indication of the size of the steam and exhaust pipe. If your engine is to run at 80 revolutions and under a 2½ inch steam pipe and 3 inch exhaust pipe will be the proper size. If a high speed engine of from 125 to 150 revolutions per minute, a 3 inch steam and 3½ inch exhaust pipe will be the proper sizes. 2. How fast can a cast iron band wheel 7 feet diameter, rim 14 inches wide, and 1½ inch thick, be run with safety? A. The hand wheel as stated, if a solid casting and sound, may be run at a velocity of 400 revolutions per minute with safety. If a split pulley with a bolted rim, it should not be trusted for more than one-half the velocity above stated. 3. Will lime in a boiler cause the tubes to leak? If so, what is the best remedy? A. Lime does not make boiler tubes leak, unless it should become so thick as to cause the tubes to become overheated and by their expansion disturb the joints. Boilers in limestone districts should be treated to a dose of caustic soda or lye, say at the rate of a pound for each 5 horse power, as often as once a month, kept in the boiler for a day's working and the boiler then thoroughly cleaned. See Davis' book on "Boiler Incrustation," $1.50 by mail. 4. Some boiler makers tell me that in putting new tubes in a fire box boiler it is best to let the tubes extend out past the tube sheet ⅛ or ¾ inch; expand to them without beading them. Others say it is best to have them the proper length and bead them down on tube sheet. Which is the best and most durable way? A. Tubes of locomotive boilers at the fire box end, if well expanded and projecting ends turned slightly out, should project no more than ¼ of an inch. If left longer, they are liable to be burned and become ragged on the edge. Close beading the end of the tube is old style, and should be abandoned. The beading tends to disturb the perfect joint made by expanding. 5. What is caustic soda, and where can I get it? There is not a merchant in all this country that can tell what it is or where it can be bought. A. It is sold as caustic lye or caustic potash. It is sodium hydrate.

(5988) W. W. W. asks: 1. What is the principle on which cream separators work, that is, how is the milk separated from the cream? A. The difference in specific gravity causes the separation. Long standing or centrifugal force may be applied. 2. What is the best way to learn electrical engineering—to take a college course or to enter an electrical establishment? If the latter is the better, please tell me what course to adopt to get into one. A. Go to a college. For courses in factories apply to the General Electric Co., Lynn, Mass., and Schenectady, N. Y. 3. Where is Lake Copais, spoken of in your last SCIENTIFIC AMERICAN? A. Lake Copais is situated in Greece.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

April 17, 1894,

AND EACH BEARING THAT DATE

[See note at end of list about copies of these patents.]

Acid, apparatus for distributing carbonic, E. Ruef 518,513
Air and gas mixing apparatus, Hay & Kearns 518,481
Air heating apparatus, J. Howden 518,495
Alarm. See Burglar alarm.
Album, photograph, J. Ekval 518,346
Amalgamating ores, method of and apparatus for, R. F. Edwards 518,543
Ammonia liquor, apparatus for causticizing, E. Solvay 518,429
Ammonia, purifying, E. Solvay 518,428
Animal trap, F. J. Bragunier 518,493
Armature, Egger & Wessel 518,512
Armature, electric motor, H. P. Brown 518,502
Armature for dynamo-electric machines, E. Thomson 518,290
Autographic register, W. L. Sayy 518,330
Axle box, car, G. W. Griffiths 518,524
Axle box dust guard, T. H. Symington 518,288
Axle box dust guard, car, W. H. Wright 518,365
Axle lubricator, car, W. H. Wright 518,364
Bag. See Hand bag.
Ballot box, H. H. Niebur 518,351
Basket, waste paper, E. L. Weston 518,476
Bearing, antifriction ball, H. La Casse 518,321
Bearing for shafts of lawn mowers, E. G. Passmore 518,498
Bearing for wheels, etc., thrust, J. S. Chace 518,303
Belt regulator, automatic, Egger & Wessel 518,314
Beverages, apparatus for making carbonated, J. Mackesy *et al* 518,577
Bicycle, H. La Casse 518,411
Bicycle, C. E. Whitaker 518,338
Bicycle crank, F. F. Ide 518,456
Bicycle, folding, M. R. Ryan 518,330
Bicycle lock attachment, W. & S. H. Lamb, Jr. 518,325
Bicycle stand, F. B. Mueller 518,326
Billiard cue lock, H. C. Hart 518,317
Billiard tables, device for marking balk-lines on, S. S. Harman 518,450
Blind stop, L. Jobin 518,308
Board. See Drygoods board.
Boat. See Paddlewheel boat.
Boiler. See Steam boiler.
Bolt cutter head, Bruch & Eilers 518,322
Bolt socket, B. Heymanson 518,405
Book, duplicating order, E. D. Gibbs 518,400
Book rack, G. W. Parker 518,573
Boot or shoe uppers, machine for creasing, G. Knight 518,410
Boring machine, Meggenhofen & Courtright 518,302
Bottle washer, H. La Casse 518,322
Bottles, machine for removing tinfoil from, E. Rantz 518,275
Bottling machine, R. Kolliker 518,327
Box. See Ballot box. Collapsible box. Twine box.
Box cover, adjustable, G. W. Stoker 518,554
Bracket and card holder, McArdle & Furay 518,336
Brake. See Car brake.
Brick machine mould, J. Leonhardt 518,461
Brick machine plunger, J. Leonhardt 518,460
Bridle, J. R. McLeod 518,425
Broiler, W. Hailes 518,745
Brush, revolving cleaning, W. R. Nightingale 518,352
Building, C. A. Prasay 518,274
Bundling machine, Hutchinson & Tyler 518,748
Burglar alarm, McLaughen & Galiant 518,532
Burial casket, Stein & Rappisyea 518,553
Burner. See Gas burner. Hydrocarbon burner.
Button fluishing machine, H. A. Berger 518,340
Cabinet, parasol or umbrella, A. Bever 518,390
Caddy, flour, A. Palmer 518,271
Calculating machine, S. R. Stallard 518,374
Calculator for wages, D. L. Albert 518,486
Can. See Oil can. Sheet metal can.
Car brake, F. E. Gilling 518,401
Car coupling, W. Dunlap 518,492
Car coupling, J. La Burt 518,256
Car coupling, J. W. Ramsey 518,355
Car, electric motor, H. P. Brown 518,221
Car fender, tram, F. S. Hogg 518,571
Car grain door, Lee & Lagell 518,528
Car, mail or express, C. Zimmerman 518,477
Car starter and brake, C. H. O. Leverkus 518,271
Car ventilator, G. A Boyden 518,220
Cars, controller for electric railway, W. H. Knight 518,254
Cars, safety wrench for, unloading, T. Nicholson, Jr. 518,533
Case. See Preserving case.
Cash drawer and manual recorder, E. H. Minnigh 518,264
Cash register, indicator, and recorder, H. Cook 518,344
Cash register, indicator, and recorder, W. T. McGraw 518,297
Cask, Stevens & Baker 518,537
Ceiling, metallic, C. C. Moore 518,464
Centerboard, boat, J. Couch 518,364
Chain, R. A. Breul 518,484
Chain drive, T. Corscaden 518,307
Chain making machine, R. G. Barnes *et al* 518,141
Chair seat, E. L. Bent 518,333
Chest, tool, Waggoner & Carmichael 518,396
Chimney cowl, Faulhaber & Koch 518,398
Chlorine, making, W. Donald 518,445, 518,446
Chopping knife, F. H. Rundell 518,279
Cigar tip cutter and dice throwing apparatus, R. & R. Rabiger 518,469
Cigarette machine, L. L. Maxfield 518,261
Cleat, ceiling, H. P. Ball 518,274
Cleat, ceiling, H. C. Wirt 518,367
Clevis, S. E. Bricker 518,486
Clip for letters, accounts, etc., E. Keller 518,252
Clock, electric tower, C. D. Warner 518,237
Clothes line swinging support, B M. Ersley 518,397
Clothes wringer and washtub, combined, C. F. & W. Lewis 518,419
Clover feeder, W. E. A. Ayers 518,490
Cock, gas burner, G. A. Ries 518,280
Coin controlled machine, W. T. Lewis (r) 11,415
Collapsible box, A. Orth 518,270
Compensator, W. Daves 518,488
Condenser and feedwater heater, combined surface, J. B. McCurdy 518,471
Cooler for cinder notches, S. R. Fellows 518,450
Corn cutting and shocking machine, A. B. Robinson 518,551
Corn separator, husker, and fodder shitter, C. H. Taylor 518,359
Corn shocks, device for loading, G. W. Collins 518,497
Cotton, machine for handling and cleaning seed, W. E. Elam 518,318
Couch, swinging, J. Keller 518,547
Counters, bars, etc., combined arm rest and guard for, W. C. Russ (r) 11,414
Coupling. See Car coupling.
Crimping machine, S. W. Jamison 518,249
Cup, funnel, and stopper securer, combined, A. C. McAlpin 518,530
Cupola furnace, J. Blakeney 518,488
Current motor, universal phase alternate, T. Duncan 518,310
Cut-out motor, C. D. Haskins 518,244
Cutter. See Cigar tip cutter. Paper cutter.
Deflector, light, D. E. Hawkins 518,562
Derrick, W. R. Close 518,295
Desk, wall, J. F. Figgins 518,567
Dice throwing device, C. B. Grove 518,316
Dish cleaner, F. H. West 518,296
Display rack, rotary, F. A. Jewett 518,580
Door hanger, M. C. Richards 518,276
Door stop, W. M. Coats 518,243
Dress protector, O. H. Still 518,378
Drop press, G. W. Peck 518,353
Drygoods board, G. Tetreau 518,379
Drying chambers, apparatus for hanging webs in folds in, Mather & Christie 518,508
Dust pan, L. A. Powers 518,273
Dye, blue, Krekeler & Krais 518,468
Dyeing apparatus, A. Dreze 518,728
Easel, G. Faint 518,544
Egg tray, F. F. Bischoff 518,341
Electric current recorder, J. W. T. Olan 518,534
Electric current regulator, A. G. Waterhouse 518,559
Electric currents, regulating, A. G. Waterhouse 518,560
Electric machine, coin-controlled, R. J. Merker 518,462
Electric machine, dynamo, H. E. Dikeman 518,444
Electric machine regulator, dynamo, L. Bell 518,218
Electric machine regulator, dynamo, W. H. Elkins 518,220
Electric machine regulator, dynamo, C. L. F. Muller 518,349
Electric meter, T. Duncan 518,311
Electric motor, H. P. Brown 518,561
Electric motor controller, W. Cooper 518,245
Electric motors, cooling, E. Thomson 518,291
Electric starting switch, F. V. Henshaw 518,404
Electric switch, A. Ekstrom 518,393
Electric switch, J. B. Smith 518,471
Electrical contact mechanism, J. F. Blake 518,483
Elevator. See Hydraulic elevator.
Elevator door operating mechanism, E. C. Jenkins 518,406
Elevator gate, automatic, J. McLaughlin 518,774
Elevator logs, means for operating, J. H. Finley 518,400
Engine. See Rotary engine. Rotary steam engine.
Excavating and refilling, system of, B. J. Coyle 518,304
Exhibitor, casket or coffin, W. P. Sherman 518,395
Fence machine, wire, W. P. Randall 518,426
Fence, wire, J. & C. Lane 518,506
Fender. See Car fender.
Fiber brake, crusher, and cleaner, J. F. Lester 518,260
Fiber feeding machine, A. H. Morton 518,419
File for keeping records, D. E. Thomas 518,290
Firearm, breech-loading, E. Elder 518,446
Fire escape, W. S. Parman 518,272
Fire extinguishing apparatus, A. L. E. Lecharlier 518,256
Fish culture, nursery pond for, C. A. Hoxsie 518,310
Fish pond, artificial, C. A. Hoxsie 518,318
Foot rest, C. B. Demarest 518,440
Furnace. See Cupola furnace. Reverberatory and regenerative furnace. Smoke consuming furnace.
Furnace, E. B. Coxe 518,573
Furnace, Engelbach & Bretherton 518,402
Furnace cast house, blast, Miller & George 518,415
Furnace cast houses, mould for blast, Miller & George 518,417
Furnace for treating refuse of cities, J. J. Storer 518,285
Garment, dancer's, M. L. Fuller 518,317
Gas, apparatus for charging liquids with, H. Ruef 518,514
Gaseous products in breweries, method of and apparatus for the recovery of waste, O. Zwietusch 518,361
Gate. See Elevator gate.
Generator. See Thermo-electric generator.
Glass, making rose-red, A. Spitzer 518,386
Grate, J. W. Smith 518,470
Gravestone or monument, O. W. Smith 518,553
Gun, cane, O. Janke 518,546
Hammock stretcher or spreader, R. C. Funke 518,568
Hand bag, J. M. Allen 518,478
Harness strap, G. A. Whipple 518,375
Harp, W. J. Richie 518,512
Harrow disk sharpener, J. T. Barker 518,715
Harrow, pulverizing, J. Boston 518,301
Harrow, rotary, H. Cromer 518,530
Harvester, corn, E. E. Witter 518,515
Hay loader, I. E. Stump 518,555
Heater. See Sad iron heater.
Heating apparatus, hot air, H. P. Judson 518,250
Hedges, mode of and appliance for plashing, M. Neil 518,405
Heel, Morrison & Purser 518,306
Hinge, T. Corscaden 518,308
Hinge, W. B. Deming 518,309
Hitching device, horse, J. G. Engburg 518,393
Hook. See Snap hook.
Hook, D. W. Holden 518,459
Horseshoes, combination tool for punching and creasing, J. Whalin 518,434
Hub, metallic, J. H. Gray 518,406
Hydraulic elevator, C. J. Dudley 518,491
Hydraulic elevator, J. G. Stamp 518,377
Hydrocarbon burner, A. J. Blackford 518,305
Ice cream freezer, J. Schaller 518,280
Incubators, thermostatic regulator for, G. Ertel 518,523
Insulating turnbuckle, H. P. Ball 518,275
Insulator strain, L. McCarthy 518,373
Iron breaking machine, pig, Miller & George 518,416
Jute or other bagging, treating, Lehman & Kraus 518,469
Keg rolling machine, W. Arnemann 518,289
Knife. See Chopping knife. Peeling knife. Skinning knife.
Lamp, G. A. McCay 518,531
Last block fastener, C. W. Moore 518,539
Lawn sprinkler, S. S. Black 518,560
Line prop, W. C. Applegate 518,479
Lock. See Safe lock.
Loom picker motion, J. H. Paige 518,424
Loop banding machine, J. M. Parker 518,425
Lubricator. See Axle lubricator.
Lubricator, Lawrence & Blackford 518,257
Magnets of alternating current dynamos, means for exciting field, L. Bell 518,217
Matrix drying machine, E. & A. E. Hall 518,569
Measuring instruments, damping device for electrical, F. Holden 518,245
Measuring instrument for multiphase systems, electric, E. W. Mix 518,265
Metal sawing machine, J. F. Landahl 518,573
Metallic tie and rail fastener, Armstrong & Wadsworth 518,439
Meter. See Cut-out meter. Electric meter.
Mica, splitting, J. Foulds, Jr 518,397
Milk bottling machine, W. A. Clark 518,346
Milk can attachment, A. D. Richman 518,550
Milking machine, Ferguson & Danks 518,394
Mill. See Ore crushing mill.
Mirror, combination, P. Wiederer 518,382
Mould. See Tank mould.
Mould foundation, Miller & George 518,418
Motor. See Current motor. Electric motor.
Mower attachment, M. Szukalski 518,480
Mule and twiner, self-acting, J. R. Wain 518,433
Musical instrument, A. H. Beyer 518,219
Musical instrument, F. A. Richter 518,369

Nail making machines, feeding mechanism for wire, A. Gouttin 518,500
Nut lock, F. B. Wallace 518,474
Oil can, F. E. Williamson 518,530
Ore crushing mill, H. Burson 518,502
Ores, extracting impurities from hematite, W. S. Potter 518,510
Packing vehicle wheels, device for, F. G. Davis 518,305
Paddle-wheel boat, J. S. Kunneth 518,256
Paint, luminous, C. Kraut 518,230
Paper cutter, roll, D. McLachlan 518,422
Paper manufactories, pulp catcher for, A. G. E. Fullner 518,208
Pastry or confectionery, machine for forming articles of, D. M. Holmes 518,454
Peeling knife, fruit, N. B. Hale 518,501
Photographic film holders, registering and marking apparatus for, H. Backenstein 518,272
Piles, method of and apparatus for preserving, A. A. Polhamus 518,264
Pipe. See Sheet metal pipe.
Pipe from mandrels, removing artificial, W. A. Tipson 518,557
Pipe joining device, W. A. Tipson 518,556
Pipe making machine, W. A. Tipson 518,558
Pipe wrench, Wynn & Gillespie 518,517
Plane, carpenter's, W. E. Crompton 518,521
Planer, automatic gear, W. & J. E. Gleason 518,497
Planter, corn, G. P. Kuhn 518,409
Pot. See Watering pot.
Preserving case, H. D. Streator 518,386
Press. See Drop press.
Printing device, hand, Smith & Tripp 518,515
Printing press delivery apparatus, S. G. Goss 518,241, 518,242
Printing presses, perforating mechanism for cylinder, E. Kellner 518,505
Printing wall paper, machine for, C. F. W. Lebmann 518,224
Pulverizer, land, H. C. Brookens 518,393
Pump, D. F. & T. Selzer 518,356
Pump, air, Wolff & Hyde, Jr. 518,372
Punch, ticket, J. M. Black 518,516
Pyrometer, Uehling & Steinbart (r) 11,413
Pyroxylin solvents and their products, manufacturing, G. O. Zeller ..... 518,386 to 518,388
Rack. See Book rack. Display rack.
Railway bond, electric, J. Meyer 518,414
Railway bridle rod, H. A. Morin 518,348
Railway conduit, electric, F. P. Bambolier 518,540
Railway, elevated, C. C. Burton 518,504
Railway, gravity, J. W. Cawdery 518,224
Railway signal, electric, B. F. Rex 518,511
Railway switch, automatic, O. E. Seifert 518,261
Railway system, electric, C. D. Tisdale 518,388
Railway track and car, C. C. Burton 518,505
Ranges, stoves, or heaters, firebox and grate for, A. R. Isaacs 518,497
Recorder. See Electric current recorder.
Refrigerating machine, L. Block 518,541
Refrigerator, J. Denson 518,395
Refrigerator, G. Fee 518,398
Register. See Autographic register. Cash register.
Regulator. See Belt regulator. Electric current regulator. Electric machine regulator.
Reverberatory and regenerative furnace, E. F. Gray 518,502
Rheostat, A. C. Dinkey 518,395
Rheostat, J. P. B. Fiske 518,220
Road worker and scraper, O. W. Stearns 518,473
Rods, machine for straightening, P. M. Hass 518,408
Rotary engine, G. W. Morthland 518,465
Rotary engine, R. Nadenicsek 518,327
Rotary engine, B. M. Wilkinson 518,436
Rotary steam engine, Williams & Fisher 518,250
Saccharine juices, purifying, G. G. Tiemann 518,538
Sack fastener, A. K. Procter 518,574
Sad iron heater, W. B. Lee 518,370
Saddle, gig, C. A. White 518,435
Safe lock, W. H. Hollar 518,455
Salt and pepper distributer, C. M. Berry 518,559
Sash balance, F. L. Rosenstreter 518,278
Sash fastener, G. M. Kimball 518,253
Sash holder, J. W. Evans 518,494
Sash holder, W. H. Masterman 518,413
Saw frame, E. J. Moxley 518,420
Saw set, H. Marshall 518,300
Sawing machine, circular, E. E. Thomas 518,422
Scale, pendulum, W. J. Graves 518,545
Scraper, road, T. R. McKnight 518,309
Screwdriver, R. L. Snyder 518,472
Seal, bottle, H. Robinson 518,377
Seeds in envelopes, machine for packaging, E. Rau 518,427
Separator. See Corn separator.
Shade, window, E. Horn 518,246
Shades, attachment for vertically adjusting window, A. W. Collison 518,505
Sheet metal can and manufacturing same, J. Lee 518,566
Sheet metal cans, machine for forming and soldering, D. D. Rannev 518,275
Sheet metal pipe, C. S. Hamlin 518,370
Shock compressor, E. W. Newberry 518,260
Shoe shanks, sheets of metallic, G. D. Bartlett 518,304
Signal. See Railway signal.
Signaling device for crossings, automatic electric, E. A. Hermann 518,535
Skate, F. Kaltner 518,251
Skinning knife, M. Cahen 518,220
Smoke preventing furnace, J. A. Baldwin 518,576
Snap hook, R. A. Breul 518,495
Sorting cards and compiling statistics, apparatus for, J. K. Gore 518,240
Spindle bearing, combined, G. O. Draper 518,447
Spring shackle and oil distributer, combined, H. A. Hammond 518,503
Sprinkler. See Lawn sprinkler.
Stamp canceling machine, G. E. Barnard 518,440
Stamping machine, A. B. Grant 518,462
Steam boiler, J. Cahall 518,519
Steam boiler, G. Cavrier 518,445
Steam boiler, M. N. Forney 518,369
Stone, artificial, E. Goode 518,239
Stop motion, electric, J. Weir 518,391
Stopper. See Tube stopper.
Store service apparatus, J. W. Thew 518,431
Strap. See Harness strap.
Sulky, W. F. & S. E. Limpus 518,507
Sulky, G. J. Loomis 518,412
Sunpenders, F. Wieland 518,258
Switch. See Electric switch. Electric starting switch. Railway switch.
Tank mould, water, Tickner & Butler 518,702
Tawed skin and making same, Norris & Burt 518,467
Telephone exchange system, Sabin & Hampton, 518,321, 518,351, 518,354
Telephone system, Sabin & Hampton 518,322
Telephone transmitter from secondary batteries, J. J. Carty 518,389
Telephonic apparatus, C. Milde 518,265
Telephony, multiplex, W. W. Jacques 518,367
Thermo-electric generator, H. B. Cox 518,542
Thermometer, E. Byrne 518,443
Thrashing machine teeth, wrench and straightener for, E. W. Oakey 518,239
Tie. See Metallic tie.
Tile, roofing, V. von Dornberg 518,294
Tin plating machine, C. R. Briton 518,347
Tire, pneumatic wheel, T. A. Egan 518,229
Tool, combination, F. R. Snyder 518,283
Toy, marble shooting, E. M. Velnor 518,295
Trap. See Animal trap.
Trolley wheel, J. D. Ansley 518,302
Trolley wire finder, automatic, T. Straus 518,297
Trousers, J. E. Leavitt 518,376
Truck, J. M. K. Pender 518,535
Truck and hoist, combined, J. F. B. Fiske 518,226
Truck for railway trains, pneumatic buffer, C. J. Gray 518,449
Truck, railway, Esser & Wessel 518,313
Tube stopper, R. W. Craine 518,292
Twine box, J. W. Herriott 518,504
Valve, fluid brake, H. Tabor 518,289
Valve, hydrant, C. H. Watson 518,475
Valve mechanism, rock drill, S. L. Ambrose 518,212
Vehicle cover and support therefor, J. H. Ransom 518,509
Ventilator. See Car ventilator.
Wagon. See Bottle washer.
Washing machine, F. Jackson 518,497
Water module or delivery regulator, C. A. D'Este 518,227
Water wheel regulating apparatus, Seamans & Van Hoesen 518,282
Waterline pen, J. H. Wotherspoon 518,477
Weigher, rotating grain, J. Buffbrook 518,297
Wells, piston for artesian or oil, W. H. Downing 518,450
Wheel. See Car roller wheel.
Windmill, A. V. Winegarden 518,300
Window, sticle, M. Zeamer 518,309
Wire loops, machine for forming, White & Lagerwall 518,301
Wire stretcher, G. W. Hughs 518,498
Wood, kindling, W. F. Hutchinson 518,247
Woodworking machine, W. Lyon 518,289
Wrench. See Pipe wrench.
Wringer. See Clothes wringer.
Writing machine, E. Grubb 518,499

DESIGNS.

Car body, J. Commerford 20,506
Key top, Graham & Savell 20,197, 20,198
Mirror frame, J. F. Lockwood 20,201
Rock, W. W. Smith 20,200
Spoon, H. H. Cabot 20,194, 20,195
Spoon, G. Rockwell 20,196
Strainer, sink, L. Pickard 20,199
Table top slab, T. Yokel ..... 20,202 to 20,205

TRADE MARKS.

Boilers, heating and power, Howe, Hopkins & Barnett 24,554
Boots and shoes, Versteeg-Grant Shoe Company 24,550
Braces, bolts, nails, screws, washers, fastenings, and similar articles of builders' hardware, Stanley Tool Works 24,562
Brandy, cognac, Moullon & Cie 24,552, 24,553
Brushes, hair and clothes, Florence Manufacturing Company 24,557
Confectioners' oil dressing, Chesapeake Oil Company 24,547
Electrical instruments for measuring current, potential, and resistance, Queen & Company 24,560
Extracts, flavoring and perfuming, C. S. Nettler 24,545
Eye water, A. E. Brady 24,538
Flour, oatmeal, and crushed cereals, E. Elsworth & Company 24,551
Flour, wheat, S. Green 24,559
Flour, wheat, Thompson Milling Company 24,553
Glass, plain, ground, or chipped sheet, Chambers Glass Company ..... 24,556 to 24,561
Glass, plain or ground sheet, Chambers Glass Company 24,556
Jewelry ornamented with precious stones, diamonds excepted, H. R. Benedict 24,534
Lard, Anglo-American Provision Company ..... 24,554 to 24,557
Liniment, W. C. Johnson 24,537
Medicinal wines, F. Comar et Fils & Cie 24,536
Medicine to neutralize the effect of microbes on the physical system, fluid, Goodman & Macatee 24,540
Mineral water, natural, Waukesha-Lithia Spring Company 24,531
Mineral waters, Gerolsteiner Sprudel W. Castendyck 24,530
Opera glasses, A. Levy 24,526
Oranges, lemons, tangerines, and grape fruit, W. R. Hillyer 24,549
Paper and envelopes, writing, G. B. Hurd & Company 24,522, 24,523
Preparations, line of proprietary, Foley & Company 24,539
Railway frog foot guards, M. Riley 24,563
Salt, F. I. W. Bursch 24,550
Shampoo for the hair, J. W. Barnum 24,541
Silver tableware, M. C. Eppenstein & Company 24,525
Skins, dyed rabbit, Lafrique & Pinton 24,524
Soap and saponaceous compounds, Small & Teed 24,543
Soap, toilet, J. B. Williams Company 24,542
Spices and flavoring extracts, John Bird Company 24,546
Tapioca, Ceylon Spice Company 24,548
Vermouth, Giuseppe & Luigi Fratelli Cora 24,535
Washing fluid, W. M. Williams 24,544
Water motors or pumps, G. J. Roberts & Company 24,565
Whisky, R. Hewson 24,564

A printed copy of the specification and drawing of any patent in the foregoing list, or any patent in print issued since 1863, will be furnished from this office for 25 cents. In ordering please state the name and number of the patent desired, and remit to Munn & Co., 361 Broadway New York.

Canadian patents may now be obtained by the inventors for any of the inventions named in the foregoing list, provided they are simple at a cost of $40 each. If complicated the cost will be a little more. For full instructions address Munn & Co., 361 Broadway, New York. Other foreign patents may also be obtained.

Advertisements.

ORDINARY RATES.

Inside Page, each insertion - - 75 cents a line
Back Page, each insertion - - - - $1.00 a line

☞ *For some classes of Advertisements, Special and Higher rates are required.*

The above are charges per agate line—about eight words per line. This notice shows the width of the line, and is set in agate type. Engravings may head advertisements at the same rate per agate line, by measurement, as the letter press. Advertisements must be received at Publication Office as early as Thursday morning to appear in the following week's issue.

Advertisements.

ORDINARY RATES.

Inside Page, each insertion, - 75 cents a line
Back Page, each insertion, - - $1.00 a line

☞ *For some classes of Advertisements, Special and Higher rates are required.*

The above are charges per agate line—about eight words per line. This notice shows the width of the line, and is set in agate type. Engravings may head advertisements at the same rate per agate line, by measurement, as the letter press. Advertisements must be received at Publication Office as early as Thursday morning to appear in the following week's issue.

THE SCIENTIFIC AMERICAN

☞ ESTABLISHED 1845.

The Most Popular Scientific Paper in the World

Only $3.00 a Year, Including Postage.

Weekly—52 Numbers a Year.

This widely circulated and splendidly illustrated paper is published weekly. Every number contains sixteen pages of useful information and a large number of original engravings of new inventions and discoveries, representing Engineering Works, Steam Machinery, New Inventions, Novelties in Mechanics, Manufactures, Chemistry, Electricity Telegraphy, Photography, Architecture, Agriculture, Horticulture, Natural History, etc. Complete list of patents each week.

Terms of Subscription.—One copy of the SCIENTIFIC AMERICAN will be sent for *one year*—52 numbers—postage prepaid, to any subscriber in the United States, Canada, or Mexico, on receipt of **three dollars** by the publishers; six months, $1.50; three months, $1.00.

Clubs.—Special rates for several names, and to Post Masters. Write for particulars.

The safest way to remit is by Postal Order, Draft, or Express Money Order. Money carefully placed inside of envelopes, securely sealed, and correctly addressed, seldom goes astray, but is at the sender's risk. Address all letters and make all orders, drafts, etc., payable to

MUNN & CO., 361 Broadway, New York.

THE

Scientific American Supplement

This is a separate and distinct publication from THE SCIENTIFIC AMERICAN, but is uniform therewith in size, every number containing sixteen large pages full of engravings, many of which are taken from foreign papers and accompanied with translated descriptions. THE SCIENTIFIC AMERICAN SUPPLEMENT is published weekly, and includes a very wide range of contents. It presents the most recent papers by eminent writers in all the principal departments of Science and the Useful Arts, embracing Biology, Geology, Mineralogy, Natural History, Geography, Archæology, Astronomy Chemistry, Electricity, Light, Heat, Mechanical Engineering, Steam and Railway Engineering, Mining, Ship Building, Marine Engineering, Photography, Technology, Manufacturing Industries, Sanitary Engineering, Agriculture, Horticulture, Domestic Economy, Biography, Medicine, etc. A vast amount of fresh and valuable information obtainable in no other publication.

The most important Engineering Works, Mechanisms, and Manufactures at home and abroad are illustrated and described in the SUPPLEMENT.

Price for the SUPPLEMENT for the United States, Canada, and Mexico, $5.00 a year; or one copy of the SCIENTIFIC AMERICAN and one copy of the SUPPLEMENT, both mailed for one year to one address for $7.00. Single copies, 10 cents. Address and remit by postal order, express money order, or check.

MUNN & CO., 361 Broadway, New York.

Building Edition.

THE SCIENTIFIC AMERICAN ARCHITECTS' AND BUILDERS' EDITION is issued monthly. $2.50 a year. Single copies, 25 cents. Thirty-two large quarto pages, forming a large and splendid Magazine of Architecture, richly adorned with *elegant plates in colors,* and with other fine engravings; illustrating the most interesting examples of modern architectural construction and allied subjects.

A special feature is the presentation in each number of a variety of the latest and best plans for private residences, city and country including those of very moderate cost as well as the more expensive. Drawings in perspective and in color are given, together with Plans, Descriptions, Locations, Estimated Cost, etc.

The elegance and cheapness of this magnificent work have won for it the Largest Circulation of any Architectural publication in the world. Sold by all newsdealers. $2.50 a year. Remit to

MUNN & CO., Publishers, 361 Broadway, New York.

PRINTING INKS.

The SCIENTIFIC AMERICAN is printed with CHAS ENEU JOHNSON & CO.'S INK, Tenth and Lombard Sts., Philadelphia, and 47 Rose St., opp. Duane, New York.